MODERATE SPECTRAL ATMOSPHERIC RADIANCE AND TRANSMITTANCE CODE (MOSART).


William M. Cornette
Prabhat Acharya
David Robertson
Gail P. Anderson

7 November 1995

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Directorate of Geophysics
AIR FORCE MATERIEL COMMAND
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<td>11. SUPPLEMENTARY NOTES * Photon Research Associates, 10350 North Torrey Pines Road, Suite 300, La Jolla, CA 92037-1020; ** Spectral Sciences, Inc., 99 South Bedford St, Burlington, MA 01803-5169</td>
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1.0 INTRODUCTION

The Moderate Spectral Atmospheric Radiance and Transfer (MOSART) computer program calculates atmospheric transmission and radiation in the ultraviolet through the microwave spectral regions (0.2 μm to infinity or 0 - 50,000 cm⁻¹). The spectral resolution is variable from a value of 2 cm⁻¹ upward in increments of 1 cm⁻¹. It contains features which have been extracted from the MODTRAN code developed by the Geophysics Division (PL/GPO) of the Air Force Phillips Laboratory and the APART code developed by Photon Research Associates (PRA). MODTRAN is widely used in many different atmospheric studies, both within and without the DoD. Since APART was developed to provide atmospheric calculations for infrared (IR) signature studies of both targets and backgrounds, it has many features that are desirable for large simulation models. Because of the requirement that MOSART be compatible with various codes used in the SSGM (Strategic Scene Generation Model), the overall structure of this version of MOSART closely follows that of APART. However, MOSART contains all the MODTRAN atmospheric features and is easily used for that code's usual point-to-point calculations.

This volume of the Users Manual provides the user with the information on the structure of the code. The other volumes in the Users Manual describe installation of MOSART (Vol. I), executing the code (Vol. II), and technical discussion (Vol. III).

MOSART and its utility programs are written in ANSI X3.9-1978 FORTRAN (FORTRAN 77) and are very portable programs. The source code delivered with MOSART includes:

FPTEST: Test machine dependent operations
INSTDB: Installs direct access binary data bases
MOSART: Is the main MOSART program
PLTGEN: Makes graphs of the results
ASCBIN: Converts binary files to ASCII and vice-versa
CRFILE: Assists in preparing the MOSART input file
MRFLTR: Degrades the spectral output using a filter function
BBTEMP: Converts radiance to equivalent blackbody temperatures
VISUAL: Converts visible radiances to luminances and determines color
SGNGEN: Creates statistical scenes
FACET: Calculates the signature of simple geometric shapes
TERTEM: Calculates terrain material temperatures
2.0 DATA FLOW AND SYSTEM STRUCTURE

The overview of the MOSART system architecture and the basic data flow are discussed below.

2.1 Software Architecture Overview

Version 1.40 of the MOSART code consists of 96,847 lines of code. It is comprised of a main program, 154 subroutines, 86 real functions, 9 double precision functions, 1 logical function, 6 complex functions, 13 integer functions, 3 character functions, and 59 BLOCK DATA modules. It also accesses up to 14 direct access binary data files and utilizes up to 2 scratch files. An architecture diagram is shown in Figure 1.

The MOSART code is supported by several codes. These are:

- ASCBIN provides ASCII-binary conversion and creates spectral tables. It consists of the 4,733 lines of code. It is comprised of a main program, 16 subroutines, 7 real functions, 2 integer functions, 4 double precision functions, 3 character functions, and 3 BLOCK DATA modules.

- BBTEMP converts radiance to equivalent blackbody temperatures. It consists of 7,207 lines of code. It is comprised of a main program, 14 subroutines, 9 real functions, 4 double precision functions, 2 integer functions, 3 character functions, and 5 BLOCK DATA modules.

- CRFILE creates the various input files. It consists of 9,170 lines of code. It is comprised of a main program, 34 subroutines, 13 real functions, 3 character functions, 3 integer functions, 1 double precision function, and 9 BLOCK DATA modules.

- FACET calculates the signature of simple geometric objects. It consists of 8,551 lines of code. It is comprised of a main program, 17 subroutines, 14 real functions, 6 double precision functions, 3 character functions, 2 integer functions, 2 complex functions, and 5 BLOCK DATA modules.

- FPTTEST tests various machine-dependent parameters prior to installation of the other codes. It consists of 2,614 lines of code. It is comprised of a main program, 5 subroutines, 5 real functions, 4 double precision functions, 1 logical function, 1 integer function, 1 character function, and 1 BLOCK DATA module.
• INSTD installs the direct access binary data bases. It consists of 2,709 lines of code. It is comprised of a main program, 5 subroutines, 1 integer function, 2 character functions, and 3 BLOCK DATA modules.

• MRFLTR spectrally integrates a MOSART binary output file over a different spectral interval or with a different filter function. It consists of 27,865 lines of code. It is comprised of a main program, 63 subroutines, 15 real functions 4 double precision functions, 11 integer functions, 3 character functions, and 14 BLOCK DATA modules.

• PLTGEN provides spectral plots using the NCAR plotting software package. It consists of 2,342 lines of code. It is comprised of a main program, 8 subroutines, 3 character functions, 1 integer function, and 2 BLOCK DATA modules.

• SCNGEN creates statistical two-dimensional scenes. It consists of 3,625 lines of code. It is comprised of a main program, 12 subroutines, 12 real functions, 4 double precision functions, 3 integer functions, and 3 character functions.

• TERTEM calculates terrain material temperatures. It consists of 10,853 lines of code. It is comprised of a main program, 16 subroutines, 20 real functions, 4 double precision functions, 4 integer functions, 3 character functions, and 8 BLOCK DATA modules.

• VISUAL converts radiance to luminance in the visible spectral region. It consists of 6,834 lines of code. It is comprised of a main program, 16 subroutines, 5 real functions, 4 double precision functions, 2 integer functions, 1 character function, and 4 BLOCK DATA modules.

2.2 Data Flow

The basic data flow is presented in Figure 2.
Figure 2. Basic Data Flow.
Figure 2. Basic Data Flow (continued).
3.0 MODULE STRUCTURE DESCRIPTION

The module structure descriptions for the MOSART program and related utility codes are presented below.

3.1 MOSART

The subroutines and functions contained in the MOSART program are listed below in alphabetical order. In addition to a brief description of each routine, the Creation Date and Revision Date for each routine is provided.

REAL FUNCTION ABCCL4
Revised on: Mon Nov 7 14:33:47 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for CCl4.

REAL FUNCTION ABHNO4
Revised on: Mon Nov 7 14:33:47 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for HNO4.

REAL FUNCTION ABN2O5
Revised on: Mon Nov 7 14:33:47 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for N2O5.

REAL FUNCTION ABSCFC
Revised on: Mon Nov 7 14:33:48 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for the chloro-fluorocarbons.
REAL FUNCTION ABSCL0
Revised on: Mon Nov 7 14:33:47 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for CCl4.

REAL FUNCTION ABSH2O
Revised on: Tue Mar 1 07:55:51 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the water vapor absorption coefficient.

SUBROUTINE ABSMOL
Revised on: Tue Nov 22 09:07:10 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the molecular absorption coefficients.

REAL FUNCTION ABSN2
Revised on: Tue Mar 1 07:55:53 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the LOWTRAN nitrogen continuum.

REAL FUNCTION ABSN2O
Created by: Dr. William M. Cornette

This FUNCTION calculates the nitrogen oxide absorption coefficient.
REAL FUNCTION ABSNO2
Revised on: Tue May 24 13:18:17 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for NO2.

SUBROUTINE ABSO2
Revised on: Mon Aug 2 11:07:08 1993
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the Herzberg and Schumann-Runge O2 absorption coefficient.

REAL FUNCTION ABSO3
Revised on: Wed Jun 15 14:01:02 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the Hartley Huggins and Chappuis/Wulf O3 absorption coefficient.

REAL FUNCTION ABSSO2
Revised on: Tue May 24 13:18:17 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for SO2.

SUBROUTINE AECALC
Revised on: Tue May 9 10:03:08 1995
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the solar absorptivity and thermal emissivity from a reflectivity curve.
SUBROUTINE AERSOL
Created on: Wed Nov 18 15:40:40 1992
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the absorption and scattering coefficients for the aerosol, normalized to unity for extinction at a wavelength of 0.55 µm.

REAL FUNCTION AH2O2
Revised on: Tue May 4 09:19:42 1993
Created by: Dr. William M. Cornette

This FUNCTION determines the absorption coefficient for a combination of hydrogen and deuterium peroxide.

REAL FUNCTION AIRTMP
Created on: Wed Nov 18 15:40:54 1992
Revised on: Mon May 17 17:33:13 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the local surface air temperature (K) at a particular time of day. If the user has supplied a reference temperature for a given time, temperatures for other times are calculated as differences from the user-supplied temperature.

SUBROUTINE AMMNIA
Created by: Dr. William M. Cornette
Created on: 14 October 1993
Revised on: Tue Nov 2 10:42:56 1993

This SUBROUTINE determines the band model parameters for ammonia between 3050 and 3600 wavenumbers.
REAL FUNCTION AMOLSC
Created on:  Wed Nov 18 16:05:47 1992
Revised on:  Thu Jun 23 12:43:46 1994
Created by:  Dr. William M. Cornette

This FUNCTION calculates the scattering coefficient due to molecular scattering.


SUBROUTINE ASPECT
Revised on:  Mon Nov  7 14:34:11 1994
Created by:  Dr. William M. Cornette

This SUBROUTINE determines the skyshine angles.

SUBROUTINE ATMPRN
Revised on:  Tue Nov 22 09:07:10 1994
Created by:  Dr. William M. Cornette

This SUBROUTINE prints out the atmospheric parameters for the atmospheric sub-file.

DOUBLE PRECISION FUNCTION BAND
Revised on:  Mon Nov  7 14:34:12 1994
Created by:  Dr. William M. Cornette

This FUNCTION calculates the transmittance from the desired band model.
SUBROUTINE BBARSL
Created on: Tue May 4 09:14:26 1993
Revised on: Mon Nov 7 14:34:11 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines the broadband (solar and thermal) coefficients for the aerosols.

REAL FUNCTION BBO3
Created by: Dr. William M. Cornette

This FUNCTION calculates the ozone absorption from Lacis & Hansen (1974).

SUBROUTINE BCKCHK
Revised on: Thu Jun 23 12:43:51 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines if the observer is looking into the sun or the moon.

SUBROUTINE BCKGND
Revised on: Tue Nov 22 09:07:15 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the background radiance.

SUBROUTINE BCKPRN
Revised on: Tue Nov 22 09:07:09 1994
Created by: Dr. William M. Cornette

This SUBROUTINE prints out the atmospheric parameters.
REAL FUNCTION BDRF
Revised on: Tue Nov 2 10:42:28 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the incoherent bidirectional reflectance function for a rough opaque surface.

SUBROUTINE BEAUFT
Revised on: Thu Jun 23 12:43:35 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates ocean parameters as a function of wind speed.

Reference: Smithsonian Table 36, Beaufort Wind Scale

REAL FUNCTION BETA
Revised on: Thu Jun 23 12:43:46 1994
Created by: Dr. William M. Cornette

This FUNCTION computes the average backscattered fraction. The current routine uses the Cornette-Shanks phase function. The parameters and algorithms for the Henyey-Greenstein phase function are commented out with 'CHG'.

REAL FUNCTION BEAUTAU
Revised on: Fri Jul 1 15:08:49 1994
Created by: Dr. William M. Cornette

This FUNCTION computes the zenith angle dependent backscattered fraction. The routine currently uses the Cornette-Shanks phase function. The parameters and algorithms for the Henyey-Greenstein phase function are commented out with 'CHG'.
SUBROUTINE BINFIL
Revised on: Tue Nov 22 09:07:02 1994
Created by: Dr. William M. Cornette

This SUBROUTINE OPENs the binary output files.

SUBROUTINE BMOD
Revised on: Mon Nov 7 14:33:46 1994
Created by: Dr. William M. Cornette

This SUBROUTINE obtains the band parameters.

SUBROUTINE BNDMLG
Revised on: Mon Nov 7 14:33:45 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the multiple line group (MLG) partition function.

SUBROUTINE BNDPAR
Revised on: Tue Nov 22 09:07:15 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines the band parameters for all of the molecular types, molecular scattering, aerosol extinction, hydrometeors (clouds, fog and rain), and cirrus clouds.

SUBROUTINE BNTPTH
Revised on: Wed Jun 15 14:01:00 1994
Created by: Dr. William M. Cornette

This SUBROUTINE initializes the summing variables for the second leg of a path. The final variables for the first leg are used as the starting points for the second leg.
SUBROUTINE BRBNDR
Revised on: Tue Nov 22 09:07:09 1994
Created by: Dr. William M. Cornette

This SUBROUTINE directs the processing sequence for all "Broad-band" submodules.

SUBROUTINE CALCUL
Revised on: Tue Nov 22 09:07:01 1994
Created by: Dr. William M. Cornette

This SUBROUTINE is the driver for calculating the MOSART binary files.

SUBROUTINE CALEND
Revised on: Mon Apr 25 08:34:57 1994
Created by: Dr. William M. Cornette

This SUBROUTINE changes a day/month/year date to the day of the year and the decimal year, or day of the year to day/month/year and decimal year.

SUBROUTINE CHANGE
Revised on: Mon Apr 25 08:34:57 1994
Created by: Dr. William M. Cornette

This SUBROUTINE modifies a standard molecular concentration profile for temporal variations.

SUBROUTINE CHKRST
Revised on: Tue Apr 5 17:30:10 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines if a restart is required and if so, where it should start.
SUBROUTINE CHKVER
Revised on: Tue Nov 2 10:43:18 1993
Created by: Dr. William M. Cornette

Since VAX computer save different versions of the binary files, this SUBROUTINE checks to insure that the ones OPENed for summary were created at the same time. This is accomplished by comparing the heading and the title. If the file does not correspond to the source file, then it is CLOSED.

SUBROUTINE CHTIME
Created by: Dr. William M. Cornette

This SUBROUTINE converts decimal time to hours, minutes, and seconds, and vice-versa.

REAL FUNCTION CIREX
Revised on: Thu Jun 23 12:43:34 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the extinction coefficient for a cirrus cloud.

SUBROUTINE CIRRUS
Revised on: Thu Jun 23 12:43:08 1994
Created by: Dr. William M. Cornette

This SUBROUTINE defines the default parameters for the cirrus cloud models.

SUBROUTINE CITIES
Created on: 13 October 1994
Revised on: Wed Apr 26 17:06:26 1995
Created by: Dr. William M. Cornette

This SUBROUTINE determines if a given latitude/longitude is located with a specific set of urban areas.
SUBROUTINE CLDALT
Created on: Wed Nov 18 15:43:02 1992
Revised on: Thu Jun 23 12:42:56 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the cloud altitudes for the low, middle, and high etage cloud layers.

SUBROUTINE CLDLVR
Revised on: Tue May 4 09:18:15 1993
Created by: Dr. William M. Cornette

This SUBROUTINE computes the optical properties for cloud layers; i.e., scattering optical depth and backscattering fraction.

SUBROUTINE CNSTNT
Created by: Dr. William M. Cornette

This SUBROUTINE initializes the constants for the program. Some of these are provided in the commented out INTRINSIC and EXTERNAL Declarations. If your computer uses one not listed, please contact Dr. William M. Cornette.

Certain routines are available for determining appropriate numerical constants. These should be used if available.
REAL FUNCTION ADD

The following eight (8) functions are used by CNSTNT to force the storage of numbers into their standard format. Some computers (e.g., IBM PC Lahey) use a greater precision for internal register manipulation.

Created on: 15 February 1993
Created by: Dr. William M. Cornette

This FUNCTION performs the addition of two REAL variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

REAL FUNCTION SUB

Created on: 15 February 1993
Created by: Dr. William M. Cornette

This FUNCTION performs the subtraction of two REAL variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

REAL FUNCTION MUL

Created on: 23 August 1993
Created by: Dr. William M. Cornette

This FUNCTION performs the multiplication of two REAL variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.
REAL FUNCTION DIV
Created on: 23 August 1993
Created by: Dr. William M. Cornette

This FUNCTION performs the division of two REAL variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

DOUBLE PRECISION FUNCTION DADD
Created on: 15 February 1993
Created by: Dr. William M. Cornette

This FUNCTION performs the addition of two DOUBLE PRECISION variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

DOUBLE PRECISION FUNCTION DSUB
Created on: 15 February 1993
Created by: Dr. William M. Cornette

This FUNCTION performs the subtraction of two DOUBLE PRECISION variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

DOUBLE PRECISION FUNCTION DMUL
Created on: 23 August 1993
Created by: Dr. William M. Cornette

This FUNCTION performs the multiplication of two DOUBLE PRECISION variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.
DOUBLE PRECISION FUNCTION DDIV
Created on: 23 August 1993
Created by: Dr. William M. Cornette

This FUNCTION performs the division of two DOUBLE PRECISION variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

INTEGER FUNCTION IBITS
Created on: 11 February 1993
Created by: Dr. William M. Cornette

This FUNCTION duplicates the MIL-STD-1753 INTRINSIC FUNCTION IBITS using the MIL-STD-1753 INTRINSIC FUNCTIONs IBSET, IBCLR, and BTEST. IBM VS FUNCTIONs include the latter three, but not the FUNCTION IBITS.

SUBROUTINE COAT
Revised on: Tue Nov 2 10:42:53 1993
Created by: Dr. William M. Cornette

This SUBROUTINE calculates absorption and scattering efficiencies for a coated sphere. For given radii and refractive indices of inner and outer spheres, refractive index of surrounding medium, and free space wavelength, COAT calculates size parameters and relative refractive indices.

REAL FUNCTION COMFNC
Revised on: Mon May 17 17:33:30 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the optical depth terms for the plume data file.
SUBROUTINE CONFIG
Revised on: Mon Aug 2 11:06:42 1993
Created by: Dr. William M. Cornette

This SUBROUTINE provides a method for system level setting of the configuration of the computer environment.

INTEGER FUNCTION ERROR_HANDLER
Created on: 3 December 1992
Revised on: Mon Aug 2 11:06:42 1993
Created by: Dr. William M. Cornette

This FUNCTION handles floating point error conditions. It presently STOPs execution if a floating point error occurs.

SUBROUTINE COUPLE
Revised on: Mon Nov 7 14:33:43 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the multiple scattering components.

COMPLEX FUNCTION CPF12
Revised on: Tue Mar 1 07:55:48 1994
Created by: Dr. William M. Cornette

This FUNCTION computes the real (WR) and imaginary (WI) parts of the complex probability function \( w(z) = \exp(-z^2) \text{erfc}(-i^*z) \) in the upper half-plane \( z=x+i^*y \) (i.e., for \( y \geq 0 \)). Maximum relative error of \( \text{WR} \text{LT}.2.0\text{E}-06 \), that of \( \text{WI} \text{LT}.5.0\text{E}-06 \). This routine developed by J. Humlicek, JQSRT, Vol 21, p. 309 (1980).
REAL FUNCTION CSPHFN
Revised on: Thu Jun 23 12:43:33 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the Cornette-Shanks phase function. The
Henyey-Greenstein function is commented out with 'CHG'.

REAL FUNCTION DBANDS
Created by: Dr. William M. Cornette

This FUNCTION maps the surface brightness of a simple zodiacal dust band model
for a set of ecliptic coordinates. Contributions from three band pairs, nominally
corresponding to the three principal band pairs observed by IRAS, are added along
the line-of-sight. Output is in W/cm^2/sr/cm^-1.

SUBROUTINE DBINIT
Created on: Wed Nov 18 15:44:05 1992
Revised on: Tue Nov 22 09:07:04 1994
Created by: Dr. William M. Cornette

This SUBROUTINE initializes the arrays used with respect to the data bases.

REAL FUNCTION DDIF
Created by: Dr. William M. Cornette

This FUNCTION calculates the three layer composite downward diffuse flux from
solar beam given individual layer downward diffuse from solar fluxes and two-stream
reflection and transmission functions.
SUBROUTINE DEFA LT
Revised on: Tue Nov 22 09:07:02 1994
Created by: Dr. William M. Cornette

This SUBROUTINE sets the default values for the undefined input parameters.

SUBROUTINE DEFBCK
Revised on: Tue Nov 22 09:07:14 1994
Created by: Dr. William M. Cornette

This SUBROUTINE defines the background parameters for the observer-source-background geometry scenario.

SUBROUTINE DEMSXX
Created on: Wed Nov 18 15:45:03 1992
Revised on: Mon Nov 7 14:34:13 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the emissivities EMV and EMH as a function of angle for a series of dielectric layers.

REAL FUNCTION DENO AIR
Revised on: Tue May 2 16:38:11 1995
Created by: Dr. William M. Cornette

This FUNCTION calculates the density (g/m³) of moist air.

REAL FUNCTION DENO WTR
Revised on: Mon May 17 16:41:39 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the density of water as a function of temperature (gm/m³).
REAL FUNCTION DEPOL
Created on: Fri May 26 14:38:54 1995
Revised on: Tue May 30 12:58:08 1995
Created by: Dr. William M. Cornette

This FUNCTION calculates the molecular depolarization parameter.


DOUBLE PRECISION FUNCTION DERF
Revised on: Fri Sep 24 13:52:46 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the error function by rational approximation. The error is less than 1.5D-07.

SUBROUTINE DESAER
Revised on: Mon May 17 17:33:32 1993
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the attenuation coefficients and asymmetry parameter for the Desert aerosol based on the wind speed.

SUBROUTINE DFLT2
Created on: Wed Nov 18 15:44:54 1992
Created by: Dr. William M. Cornette

This SUBROUTINE established the defaults for the model atmosphere, haze profile, aerosol types, and related parameters.
SUBROUTINE DFLT8
Revised on: Tue Nov 22 09:07:09 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines the default conditions for the spectral inputs.

COMPLEX FUNCTION DIREFL
Created on: Wed Nov 18 15:45:00 1992
Created by: Dr. William M. Cornette

This FUNCTION calculates the Fresnel coefficients of a dielectric surface.

SUBROUTINE DIREMS
Created on: Wed Nov 18 15:45:03 1992
Revised on: Mon Nov 7 14:34:14 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the emissivities EMV and EMH as a function of angle for a series of dielectric layers.

SUBROUTINE DISEND
Created by: Dr. William M. Cornette; Dr. Prabhat K. Acharya

This SUBROUTINE positions the pointer to the end of the DIS file.

SUBROUTINE DISPRN
Revised on: Mon Nov 28 10:08:07 1994
Created by: Dr. William M. Cornette; Dr. Prabhat K. Acharya

This SUBROUTINE write the records to the DIS file.
REAL FUNCTION DNDR
Created on: Wed Nov 18 15:45:05 1992
Created by: Dr. William M. Cornette

This FUNCTION calculates the number of particles in a radius interval according to parameters of selected size distribution.

REAL FUNCTION DPLDT
Created on: Wed Nov 18 15:45:10 1992
Revised on: Tue Nov 2 10:42:50 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the partial derivative of the spectral blackbody curve (Planck function) (W/cm$^2$/cm$^{-1}$/K).

SUBROUTINE DRTLAY
Created on: Wed Nov 18 15:45:16 1992
Revised on: Tue Nov 22 09:07:01 1994
Created by: Dr. William M. Cornette


REAL FUNCTION DVINCR
Created on: Wed Nov 18 15:45:19 1992
Revised on: Mon Nov 7 14:34:08 1994
Created by: Dr. William M. Cornette

This FUNCTION determines the wavenumber increment for a defined wavenumber value.

SUBROUTINE ECLGAL
Revised on: Mon May 17 17:33:00 1993
Created by: Dr. William M. Cornette

This SUBROUTINE transforms the ecliptic coordinates to galactic coordinates.
REAL FUNCTION EHBSL0
Revised on:  Tue Nov 2 10:42:25 1993

This FUNCTION calculates for positive X, EXP(-X)*I0(X), where I0 is the hyperbolic (modified) Bessel function of the first kind and zeroth order.

REAL FUNCTION EMISSV
Revised on:  Mon Nov 7 14:34:08 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the volumetric emissivity appropriate at the distance and wavelength of interest (W/cm²/sr/cm³).

COMPLEX FUNCTION EMTREF
Created on:  Wed Nov 18 15:58:01 1992
Revised on:  Mon Aug 2 13:13:34 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the effective index of refraction for a mixture of two dielectric mediums.

SUBROUTINE ENDPT
Revised on:  Tue Nov 22 09:07:14 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines the end point of a ray, given the slant range or the earth center angle, the initial altitude, and the direction.

SUBROUTINE EPHEML
Revised on:  Tue Mar 1 07:55:53 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the position of the moon in the sky and the phase of the moon. Indices are set if either a lunar or a solar eclipse is possible.
SUBROUTINE EPEMHS
Created on: Wed Nov 18 15:58:10 1992
Revised on: Mon Nov 7 14:34:07 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the solar and lunar positions.

DOUBLE PRECISION FUNCTION EPHTIM
Created on: Wed Jun 15 14:01:14 1994
Revised on: Tue Jun 28 08:00:22 1994
Created by: Dr. William M. Cornette

This FUNCTION converts from Universal Time to Ephemeris Time.

SUBROUTINE EQABS
Revised on: Tue Nov 22 09:07:14 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the equivalent absorber amounts.

SUBROUTINE EQUABS
Revised on: Tue Nov 22 09:07:09 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the equivalent absorber amounts.

SUBROUTINE EQUECL
Created on: Wed Nov 18 15:58:45 1992
Revised on: Mon May 17 17:33:06 1993
Created by: Dr. William M. Cornette

This SUBROUTINE transforms equatorial coordinates to ecliptical coordinates.
SUBROUTINE ESFIT
Revised on:  Mon Nov 7 14:34:07 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the exponential sum fit for the transmittance function.
The Malkmus band model is used to represent the transmittance function.

REAL FUNCTION EVAPOR
Revised on:  Mon May 17 16:41:23 1993

This FUNCTION calculates the latent heat of evaporation for water.

LOGICAL FUNCTION EVEN
Created on:  Wed Nov 18 15:59:02 1992
Created by: Dr. William M. Cornette

This FUNCTION determines if an INTEGER is even or not.

REAL FUNCTION EXGALS
Revised on:  Mon May 17 16:41:27 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the extragalactic radiance (W/cm²/sr/cm⁻¹).

SUBROUTINE EXOATM
Revised on:  Tue May 24 13:18:03 1994
Created by: Dr. William M. Cornette

This SUBROUTINE loads the proper values of temperature and pressure in the
arrays TUX and PUX, respectively for the upper atmosphere (i.e., above 100 km).
REAL FUNCTION EXOTMP
Created on: Mon Jul 23 11:16:11 1990
Revised on: Sun Nov 27 20:47:59 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the exoatmospheric temperature to be used to select the proper upper atmosphere profile.

SUBROUTINE FILOPN
Revised on: Tue Nov 22 09:07:10 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines if a user-specified file is to be OPENed or not. If not, the unit number is set to 0.

SUBROUTINE FILRT
Revised on: Tue Nov 22 09:07:03 1994
Created by: Dr. William M. Cornette

This SUBROUTINE uses a file root name to establish several filenames for input, ASCII output, and binary output.

REAL FUNCTION FILTER
Revised on: Thu Jun 23 12:43:44 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the filter response specified.

SUBROUTINE FLSTAT
Revised on: Tue Nov 22 09:07:02 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines the status of the binary data files.
SUBROUTINE FLUXLW
Revised on:  Tue Mar 1 07:55:52 1994
Created by:  Dr. William M. Cornette

This SUBROUTINE computes the upward and downward diffuse fluxes in the terrestrial (longwave) band.

SUBROUTINE FRESNL
Revised on:  Thu Jun 23 12:43:43 1994

This SUBROUTINE calculates the reflectivities and transmissivities for horizontally and vertically polarized electric fields.

REAL FUNCTION GALRAD
Revised on:  Mon May 17 17:33:43 1993
Created by:  Dr. William M. Cornette

This FUNCTION calculates the spectral mean space background due to diffuse galactic sources in W/sr/cm²/cm⁻¹.

REAL FUNCTION GAM
Created by:  Dr. William M. Cornette

This FUNCTION calculates the three layer composite multiple reflection factor, given the individual layer reflection and transmission functions.

REAL FUNCTION GAMMLN
Revised on:  Thu Feb 11 15:26:05 1993
Created by:  Dr. William M. Cornette

This FUNCTION calculates the natural logarithm of the gamma function for DX > 0.
SUBROUTINE GBLBCK
Revised on: Thu Jun 23 12:42:56 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines the terrain scene and altitude as a function of latitude and longitude for the global data base.

SUBROUTINE GEOM
Revised on: Mon Nov 7 14:34:06 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the geometric parameters for a specified ray path through a spherically isotropic atmosphere.

SUBROUTINE GETASPM
Created on: Wed Nov 18 15:56:05 1992
Revised on: Tue Nov 22 09:07:08 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads in the earth/skyshine aspect parameters.

SUBROUTINE GETATM
Revised on: Tue Nov 22 09:07:08 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads in the model atmosphere parameters.

SUBROUTINE GETBCK
Revised on: Tue Nov 22 09:07:08 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads in the terrain and background parameters.
SUBROUTINE GETCLD
Revised on: Tue Nov 22 09:07:08 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads in the hydrometeor (cloud, fog, rain, snow) parameters.

SUBROUTINE GETEXO
Revised on: Mon Nov 7 14:34:14 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads in the exoatmospheric parameters.

SUBROUTINE GETGLC
Revised on: Tue Mar 1 07:55:47 1994
Created by: Dr. William M. Cornette

This SUBROUTINE obtains the desired Gauss-Legendre coefficients.

SUBROUTINE GETPOS
Revised on: Tue Nov 22 09:07:08 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads in the source position and time.

SUBROUTINE GETSLR
Created on: Wed Nov 18 15:56:40 1992
Revised on: Tue Nov 22 09:07:08 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads in the solar and lunar data.
REAL FUNCTION GETVAR
Revised on: Mon Apr 25 08:34:50 1994
Created by: Dr. William M. Cornette

This FUNCTION reads a REAL variable contained in free format in the CHARACTER string VARIAB.

SUBROUTINE GETVEC
Revised on: Thu Jun 23 12:43:24 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads a REAL vector contained in free format in the CHARACTER string VARIAB.

SUBROUTINE H2OCNT
Revised on: Tue Mar 1 07:55:36 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the LOWTRAN self- and foreign-broadened line wings absorption coefficients.

REAL FUNCTION HAZE
Created on: Wed Nov 18 15:54:02 1992
Revised on: Mon Nov 7 14:34:04 1994
Created by: Dr. William M. Cornette

This FUNCTION determines the aerosol extinction coefficient (km⁻¹).

REAL FUNCTION HEYMS
Created on: Wed Nov 18 15:54:09 1992
Created by: Dr. William M. Cornette

This FUNCTION calculates the liquid water content (gm/m³) for a cirrus cloud according to Heymsfield.
REAL FUNCTION HLOWT
Revised on: Mon Aug 2 13:14:27 1993
Created by: Dr. William M. Cornette

This FUNCTION determines the boundary layer altitude based upon the LOWTRAN modification of the haze profile for elevated locations.

SUBROUTINE HOREQU
Revised on: Mon May 17 17:33:46 1993
Created by: Dr. William M. Cornette

This SUBROUTINE converts horizon coordinates to equatorial coordinates.

SUBROUTINE HORIZN
Revised on: Thu Jun 23 12:43:43 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the horizon and whether the desired geometry is beyond the horizon or not.

SUBROUTINE HTBLNC
Revised on: Thu Jun 23 12:43:23 1994
Created by: Dr. William M. Cornette

This SUBROUTINE is the layer temperature calculation algorithm.

SUBROUTINE HYDROM
Revised on: Mon Nov 7 14:34:04 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the equivalent absorber amounts for hydrometeors (clouds, fog, rain, snow, and cirrus/ice).
INTEGER FUNCTION IBKCNV
Created on: 8 November 1993
Revised on: Wed Apr 26 17:06:26 1995
Created by: Dr. William M. Cornette

This FUNCTION converts the ecosystem index into a MOSART terrain background scene index.

INTEGER FUNCTION IBNSRC
Revised on: Tue Nov 22 10:04:37 1994
Created by: Dr. William M. Cornette

This FUNCTION determines the location of X0 in the X-array. The search is binary and starts at the location KEY. The binary division point is calculated using the gradient across the X-array for the interval.

INTEGER FUNCTION IDAERO
Revised on: Tue May 24 13:18:17 1994
Created by: Dr. William M. Cornette

This FUNCTION assigns a default aerosol type base upon the type of background and altitude.

INTEGER FUNCTION IGTINT
Revised on: Mon Apr 25 08:34:50 1994
Created by: Dr. William M. Cornette

This FUNCTION reads an INTEGER variable contained in free format in the CHARACTER string VARIAB.
SUBROUTINE IGTVEC
Revised on: Sat Jun 18 13:09:51 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads a INTEGER vector contained in free format in the CHARACTER string VARIAB.

COMPLEX FUNCTION INDEXI
Revised on: Mon May 17 16:40:57 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the complex index of refraction for ice.

COMPLEX FUNCTION INDEXW
Revised on: Tue Mar 1 07:55:31 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the complex index of refraction for water.

SUBROUTINE INDXBK
Revised on: Tue May 24 13:18:10 1994
Created by: Dr. William M. Cornette

This SUBROUTINE defines the background index.

INTEGER FUNCTION INDXSC
Revised on: Mon Aug 2 11:07:12 1993
Created by: Dr. William M. Cornette

This FUNCTION defines the scene label index.
SUBROUTINE INICPL
Revised on: Tue Nov 22 09:07:16 1994
Created by: Dr. William M. Cornette

This SUBROUTINE initializes the calculations for the multiple scattering coupling.

SUBROUTINE INIGEO
Revised on: Tue Nov 22 09:07:14 1994
Created by: Dr. William M. Cornette

This SUBROUTINE initializes the geometric parameters for the GEOM routine.

SUBROUTINE INITL
Revised on: Tue Nov 22 09:07:00 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads in the MOSART input file.

SUBROUTINE INTEG
Created on: Wed Nov 18 16:00:10 1992
Created by: Dr. William M. Cornette

This SUBROUTINE integrates each variable for a band average.
SUBROUTINE INTR2D
Revised on: Thu Jun 23 12:43:43 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines the interpolation constants for a rectangular grid. First, the grid is searched to find the boundaries of the rectangular cell containing point (X0,Y0). The interpolation weights are defined as zero except for the four (4) points that define the boundary of the cell. The interpolation is designed to define a unique representation for each point in the cell, such that the center point is a equally weighted set of all four corner values. The cell is divided into four (4) triangular regions (see below) and if the (X,Y) point falls within a given region, its interpolation weights are determined by the two corner values and the center point that define the triangle.

P1                 P2
(Xi,Yi)-------------(Xi+1,Yi)
            \ /:
            \ /:
            \ Region 1 / :  
            \ /:
            \ /:
           / \  
           /  
           / \  
           /  
           / \  
           /  
           /   
           /   
           /   
           / Region 3 / Region 4
            / \  
            /  
            / \  
            /  
            /   
            /   
            /   
            / Region 2 \ :  
              / 
              / 
              /(Xi,Yi+1)-------------(Xi+1,Yi+1)
          P3                 P4

Note: The code is designed to handle the degenerate case for one-dimension (i.e., NX=1 or NY=1), as well as the double degenerate case (i.e., NX=NY=1).
CHARACTER*72 FUNCTION IOERR
Created on: 3 August 1993
Revised on: Tue Mar 1 07:55:55 1994
Created by: Dr. William M. Cornette

This FUNCTION returns the appropriate error message for the input value of IOS. The FUNCTION returns the message that an end-of-file was encountered if IOS=-1 and that normal operation if IOS=0, in accordance with the ANSI X3.9-1978 FORTRAN 77 Standard. For all other values of IOS, the message is system dependent. The following systems are implemented:

- Unix (at least for SGI and HP. Not tested on others)
- PC Lahey F77L and F77L EM/32 compilers
- IBM VS
- VAX

A generic capability is also included. If your computer uses a different method for obtaining error messages, please notify the author.

SUBROUTINE ISRAEL
Revised on: Tue May 24 13:18:13 1994
Created by: Dr. William M. Cornette

This SUBROUTINE makes sure that the Israeli Standard Atmosphere is correct for day vs. night conditions.

INTEGER FUNCTION ISTAER
Revised on: Mon Nov 7 14:34:03 1994
Created by: Dr. William M. Cornette

This FUNCTION determines the type of aerosol.
SUBROUTINE KDISTR
Revised on: Tue Nov 22 09:07:14 1994
Created by: Dr. William M. Cornette

This SUBROUTINE generates the k-distributions for the multiple scattering binary data file.

SUBROUTINE LAYLW
Created by: Dr. William M. Cornette

This SUBROUTINE computes the optical path and path-weighted temperature matrices from the vertical integrated absorber amounts.

SUBROUTINE LCTRIM
Created by: Dr. William M. Cornette

This SUBROUTINE trims any leading blanks from the character string CHRSTR.

INTEGER FUNCTION LENSTR
Created by: Dr. William M. Cornette

This FUNCTION calculates the length of the non-blank string contained in CHRSTR.

CHARACTER(*) FUNCTION LWCASE
Created by: Dr. William M. Cornette
Created on: Tue Jul 28 14:49:15 1992
Revised on: Mon Aug 2 11:06:29 1993

This FUNCTION converts STRING from upper case to lower case.
SUBROUTINE LRINT
Revised on: Thu Jun 23 12:43:40 1994
Created by: Dr. William M. Cornette

This SUBROUTINE initializes the layers for heat transfer calculations.

SUBROUTINE MARINE
Revised on: Thu Jun 23 12:43:10 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines the aerosol extinction and absorption coefficients for the Navy Maritime model.

INTEGER FUNCTION MDLATM
Revised on: Thu Feb 11 15:24:38 1993
Created by: Dr. William M. Cornette

This FUNCTION determines the model atmosphere number from the latitude index and the season index.

SUBROUTINE MIE

This SUBROUTINE calculates extinction, total scattering, and asymmetry parameters for a given size parameter and relative refractive index.

SUBROUTINE MIEINP
Revised on: Tue Nov 22 09:07:07 1994
Created by: Dr. William M. Cornette

This SUBROUTINE will read in the parameters for the Mie calculations.
SUBROUTINE MIEPHS
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the absorption and scattering coefficients, the asymmetry factor, and the polarized phase matrix.

SUBROUTINE MLSCAT
Revised on: Mon Nov 7 14:33:44 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the multiple scattering terms.

SUBROUTINE MODBCK
Created on: Wed Feb 24 11:29:35 1993
Revised on: Thu May 20 15:01:37 1993
Created by: Dr. William M. Cornette

This SUBROUTINE modifies the background parameters for snow conditions.

INTEGER FUNCTION MONTH
Revised on: Mon Aug 2 13:11:34 1993
Created by: Dr. William M. Cornette

This FUNCTION determines the month of the year from a CHARACTER argument. For example, if the CHARACTER argument is either 'JAN', 'Jan', 'jan', or '1', the function returns the value of 1 for the first month.

PROGRAM MOSART
Revised on: Tue Nov 22 09:07:01 1994
Created by: Dr. William M. Cornette

Moderate Spectral Atmospheric Radiance and Transmittance Code
SUBROUTINE MRNDFL
Created on: Wed Nov 18 15:50:02 1992
Created by: Dr. William M. Cornette

This SUBROUTINE determines the parameters for the Navy marine aerosol model.

INTEGER FUNCTION NCHAER
Revised on: Tue Jun 28 08:00:21 1994
Created by: Dr. William M. Cornette

This FUNCTION determines the aerosol model index from a CHARACTER argument. For example, if the CHARACTER argument is either 'RU', 'Ru', 'ru', or '1 ', the function returns the value of 1 for the Rural Aerosol Model.

INTEGER FUNCTION NCHATM
Revised on: Mon Aug 2 11:04:39 1993
Created by: Dr. William M. Cornette

This FUNCTION determines the model atmosphere index from a CHARACTER argument. For example, if the CHARACTER argument is either 'EQUATO', 'Equato', 'equato', or '1 ', the function returns the value of 1 for the Equatorial Model Atmosphere.

INTEGER FUNCTION NCHAZE
Revised on: Tue Jun 28 08:00:21 1994
Created by: Dr. William M. Cornette

This FUNCTION determines the haze profile index from a CHARACTER argument. For example, if the CHARACTER argument is either 'BACKGR', 'Backgr', 'backgr', or '1 ', the function returns the value of 1 for Background.
INTEGER FUNCTION NCHSEA
Revised on: Tue Jun 28 08:00:21 1994
Created by: Dr. William M. Cornette

This FUNCTION determines the season index from a CHARACTER argument. For example, if the CHARACTER argument is either 'SUMMER', 'Summer', 'summer', or '1', the function returns the value of 1 for Spring/Summer.

INTEGER FUNCTION NCYCLE
Revised on: Thu Feb 11 15:33:38 1993
Created by: Dr. William M. Cornette

This FUNCTION functions in a mode similar to the generic MOD function, only the value returned varies from 1 to NMOD, rather than 0 to NMOD-1. If the value is negative, it is added to NMOD.
SUBROUTINE NXXPAU
Revised on: Mon May 17 16:40:52 1993
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the location of the tropopause according to the definition of the conventional tropopause of the World Meteorological Organization:

The conventional tropopause is the lowest altitude at which the lapse rate decreases to 2 deg C/km or less, provided also that the average lapse rate between this altitude and all higher altitudes within two kilometers does not exceed 2 deg C/km.

Note - The lapse rate equals -DTDZ (i.e., the rate of decrease of temperature with altitude. The average lapse rate is the difference between the temperatures at the respective end points divided by the altitude interval, irrespective of the lapse-rate variations in between the end points. All higher altitudes mean that no point on the profile in the two-kilometer interval above the lowest altitude can fall to the left of the 2 deg C/km line extending from the lowest altitude.


Also, the stratopause and mesopause are also calculated.

Note: If any of the values are meaningless, then default values of 10 km, 35 km, and 75 km are used for the tropopause, stratopause, and mesopause, respectively.

REAL FUNCTION O2CNT
Revised on: Tue Mar 1 07:55:43 1994
Created by: Dr. William M. Cornette

This FUNCTION provides the oxygen continuum coefficients as a function of wavenumber and temperature.
SUBROUTINE OPATH
Created on: Wed Nov 18 15:47:45 1992
Revised on: Thu Jun 23 12:43:22 1994
Created by: Dr. William M. Cornette

This SUBROUTINE performs the vertical integration to obtain the layer absorber amounts, optical paths, flux transmissivity, and optical path matrices.

SUBROUTINE OPNSCR
Revised on: Tue Nov 2 10:43:14 1993
Created by: Dr. William M. Cornette

This SUBROUTINE OPENs a scratch file on an available file unit.

SUBROUTINE PARSE
Created by: Dr. William M. Cornette

This SUBROUTINE parses the CHARACTER string VARIN and places one field in each CHARACTER string VAROUT.

REAL FUNCTION PARTIT
Revised on: Wed Jun 15 14:01:11 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the vibration and rotation partition functions, relative to a reference temperature, for a variety of different molecules.

REAL FUNCTION PFR
Created by: Dr. William M. Cornette

This FUNCTION calculates H2O partition function corrections.
SUBROUTINE PHFUNC
Created on: Wed Nov 18 15:59:45 1992
Revised on: Thu Jun 23 12:43:03 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the scattering phase function for a specified set of aerosols and hydrometeors.

REAL FUNCTION PHMLSC
Created on: Fri May 26 14:38:54 1995
Revised on: Fri May 26 15:32:23 1995
Created by: Dr. William M. Cornette

This FUNCTION calculates the single scattering phase function for molecular scattering.


SUBROUTINE PHYDRO
Revised on: Thu Jun 23 12:43:12 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the scattering phase function for a specified set of hydrometeors.

REAL FUNCTION PLANCK
Revised on: Tue Nov 2 10:42:47 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the spectral blackbody curve (Planck function) (W/cm²/cm⁻¹).
SUBROUTINE PLANET
Created on: Wed Nov 18 15:59:54 1992
Revised on: Tue Nov 2 10:42:22 1993
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the perturbation on the solar ephemeris due to the moon and planets.

SUBROUTINE PLMSUB
Created on: Wed Nov 18 16:00:00 1992
Revised on: Mon Nov 7 14:34:02 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the parameters for the plume file.

DOUBLE PRECISION FUNCTION POLY
Created on: Wed Nov 18 16:00:05 1992
Revised on: Mon Aug 2 11:06:55 1993

This FUNCTION calculates the polynomial $C_1 + C_2 X + \ldots + C_N X^{N-1}$.

SUBROUTINE PRALT
Created on: Wed Nov 18 16:00:07 1992
Revised on: Tue Mar 1 07:55:41 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the pressure altitude (km) from the pressure, assuming the U.S. Standard (1976) Atmosphere. If the pressure is greater than 1777.6 mb or less than 0.0044568 mb, the altitude is set to 0.0, and the error flag is set.
SUBROUTINE PRCALC
Created on: Wed Nov 18 16:00:10 1992
Revised on: Tue Nov 22 09:07:07 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the transmittance and radiance for the observer-source-background, observer-source-solar/lunar, observer-background-solar/lunar paths, plus skyshine on source and background.

SUBROUTINE PRETEM
Created on: Wed Nov 18 16:00:25 1992
Revised on: Mon Nov 7 14:34:01 1994
Created by: Dr. William M. Cornette

This SUBROUTINE computes the vertical profiles of temperature altitude, H₂O, CO₂, and O₃ as a function of pressure. The pressure runs from 10 to 1010 mb in increments of 10 mb.

SUBROUTINE PROFAC
Created on: Wed Nov 18 16:00:28 1992
Revised on: Mon May 17 17:33:59 1993
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the parameters required for interpolation.

SUBROUTINE PROMPT
Created on: Wed Nov 18 16:00:30 1992
Revised on: Tue Mar 1 07:55:50 1994
Created by: Dr. William M. Cornette

This SUBROUTINE uses non-standard FORTRAN (where possible) so that a screen prompt does not give a line feed (or carriage return) immediately after writing the string.
SUBROUTINE PRTHDR
Created by:  Dr. William M. Cornette  
Created on:  Tue Nov 22 09:07:13 1994  
Revised on:  Tue Jun 28 12:34:24 1994

This SUBROUTINE prints the MOSART file header in ASCII form.

SUBROUTINE PTHOSB
Created on:  Wed Nov 18 16:00:41 1992  
Revised on:  Tue Nov 22 09:07:13 1994  
Created by:  Dr. William M. Cornette

This SUBROUTINE calculates the path radiance and variation along the observer-source-background path.

SUBROUTINE PTHTAU
Created on:  Wed Nov 18 16:00:45 1992  
Revised on:  Mon Nov  7 14:34:01 1994  
Created by:  Dr. William M. Cornette

This SUBROUTINE calculates the transmittance along a path. Either the final transmittance or the incremental transmittances are calculated.

SUBROUTINE PUTCLLD
Created on:  Wed Nov 18 16:00:50 1992  
Revised on:  Tue Nov 22 09:07:07 1994  
Created by:  Dr. William M. Cornette

This SUBROUTINE prints out the cloud summary data.

SUBROUTINE PUTHDR
Created on:  Wed Nov 18 16:00:54 1992  
Revised on:  Mon Nov 28 10:08:14 1994  
Created by:  Dr. William M. Cornette

This SUBROUTINE prints out the header for the various binary data files.
SUBROUTINE PUTSLR
Created on: Wed Nov 18 16:00:57 1992
Revised on: Tue Nov 22 09:07:06 1994
Created by: Dr. William M. Cornette

This SUBROUTINE prints out the solar, lunar, and ephemeris summary data.

REAL FUNCTION RAB
Created on: Wed Nov 18 16:01:08 1992
Created by: Dr. William M. Cornette

This FUNCTION calculates the three layer composite reflection function from above given individual layer reflection and transmission functions.

REAL FUNCTION RADFLD
Created on: Wed Nov 18 16:01:12 1992
Created by: Dr. William M. Cornette

This FUNCTION calculates the radiation field for the absorption coefficients.

REAL FUNCTION RADTRX
Created on: Wed Nov 18 16:01:16 1992
Revised on: Mon May 17 17:34:01 1993
Created by: Dr. William M. Cornette

This FUNCTION performs the integral of Y(X)/X between X1 and X2 assuming Y/X and X vary exponentially with respect to the free parameter R.

REAL FUNCTION RADTRY
Created on: Wed Nov 18 16:01:18 1992
Revised on: Mon May 17 17:34:04 1993
Created by: Dr. William M. Cornette

This FUNCTION performs the integral of Y(X) between X1 and X2 assuming Y varies exponentially with respect to the parameter X.
REAL FUNCTION RAINEX
Created on:  Wed Nov 18 16:01:22 1992
Revised on:  Mon May 17 17:34:07 1993
Created by:  Dr. William M. Cornette

This FUNCTION calculates the extinction coefficient for rain, based upon the assumption that the drop diameter is large relative to the wavelength so that the Mie extinction efficiency is independent of wavelength \((\text{Q}_{\text{ext}}=2.0)\). This assumes that the drop diameter is between 0.1 and 10 mm.

SUBROUTINE RAINSP
Created on:  Wed Nov 18 16:01:24 1992
Revised on:  Thu Jun 23 12:42:49 1994
Created by:  Dr. William M. Cornette

This SUBROUTINE calculates the normalized (to 0.55 \(\mu\)m) absorption and scattering coefficients for rain.

SUBROUTINE RAYPTH
Created on:  Wed Nov 18 16:01:28 1992
Revised on:  Mon Nov 7 14:34:00 1994
Created by:  Dr. William M. Cornette

This SUBROUTINE calculates the geometric parameters for a specified ray path through a spherically isotropic atmosphere.

REAL FUNCTION RBE
Created on:  Wed Nov 18 16:01:30 1992
Created by:  Dr. William M. Cornette

This FUNCTION calculates the three layer composite reflection function from below given individual layer reflection and transmission functions.
SUBROUTINE RDFLTR
Created on: Wed Nov 18 16:01:35 1992
Revised on: Tue Nov 22 09:07:06 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads in the user-defined filter response.

SUBROUTINE RDGBL
Created on: Mon Mar 8 15:43:02 1993
Revised on: Tue Nov 22 09:07:03 1994
Created by: Dr. William M. Cornette

This SUBROUTINE obtains the global climatology parameters from the global data base, or sets defaults values.

SUBROUTINE RDLINE
Created on: Wed Nov 18 16:01:38 1992
Revised on: Wed Jun 15 14:01:21 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads an input buffer from unit IUNIT. It is assumed that the input file is structured in CHARACTER*80 lines with any line that is to be continued terminated by the '&' character. Any number of characters can be read subject to the limitation that only a string of the maximum length of OUTBUF will be returned. ISKIP characters and any leading blanks will be ignored in the first line read.

SUBROUTINE RDSCN
Created on: Mon Mar 8 15:43:02 1993
Revised on: Tue Nov 22 09:07:03 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads the scene type and the altitude from the scenes data base, or sets defaults values.
COMPLEX FUNCTION REFEST
Created on: Wed Nov 18 16:01:42 1992
Revised on: Mon Apr 25 08:34:55 1994
Created by: Dr. William M. Cornette

This FUNCTION estimates the complex index of refraction from the reflection coefficient.

DOUBLE PRECISION FUNCTION REFRAC
Created on: Wed Nov 18 16:01:49 1992
Revised on: Thu Jun 23 12:43:50 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the refractivity or modified refractivity of the earth's atmosphere.

Note: Refractivity, \( N = (n-1)*1.E+06 \), where \( n \) is the index of refraction.
 Modified refractivity, \( M = (nr/re-1)*1.E-06 \), where \( re \) is the radius of the earth and \( r = re + h \), where \( h \) is the altitude.

REAL FUNCTION RELHUM
Created on: Wed Nov 18 16:01:52 1992
Created by: Dr. William M. Cornette

This FUNCTION determines the relative humidity using a modified definition of the relative humidity as defined by the Twelfth Conference of Directors of the International Meteorological Organization (Resolution 166, dated 1947). The modification involves the expression of relative humidity as a fraction rather than a percentage.

SUBROUTINE RESOLV
Created on: Wed Nov 18 16:01:55 1992
Revised on: Thu Jun 23 12:43:42 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the increment of the calculations.
SUBROUTINE RSHINE
Created on: Wed Nov 18 16:01:58 1992
Revised on: Mon Nov 7 14:33:42 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the skyshine.

REAL FUNCTION SATUR
Created on: Wed Nov 18 16:02:09 1992
Revised on: Thu Jun 23 12:43:30 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the saturation level of water vapor or ice in ppmv.

REAL FUNCTION SCINTL
Created on: Wed Nov 18 16:02:12 1992
Revised on: Mon May 17 16:40:46 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the scintillation from the path averaged turbulence. Aperture averaging using the work of D.L. Fried (JOSA 57 (1967) pp. 169-175) is used.

SUBROUTINE SCNRIIO
Created on: Wed Nov 18 16:02:15 1992
Revised on: Tue Nov 22 09:11:59 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the ray paths for the desired observer-source-background geometry scenario.

REAL FUNCTION SEAICE
Created on: Mon Mar 8 15:43:02 1993
Revised on: Tue May 2 16:38:12 1995
Created by: Dr. William M. Cornette

This SUBROUTINE reads the scene type and the altitude from the scenes data base, or sets defaults values.
REAL FUNCTION SEATMP
Created on: 12 April 1993
Revised on: Tue Nov 2 10:42:47 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the ocean temperatures (K) at the surface for four seasons of the year. A temperature of zero (0.0) implies that only terrain exists in the 5 deg by 5 deg resolution cell.

COMPLEX FUNCTION SEAWTR
Created on: Wed Nov 18 16:02:19 1992
Created by: Dr. William M. Cornette

This FUNCTION calculates the complex dielectric constant of water and sea water by the Debye formula.


SUBROUTINE SETALT
Created on: Wed Nov 18 16:02:21 1992
Revised on: Mon Nov 7 14:33:59 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines the altitude grid points.

SUBROUTINE SETBCK
Created on: Wed Nov 18 16:02:26 1992
Revised on: Tue Nov 22 09:07:13 1994
Created by: Dr. William M. Cornette

This SUBROUTINE sets the background parameters.

SUBROUTINE SETFLG
Created on: Wed Nov 18 16:02:29 1992
Revised on: Mon Apr 25 08:34:59 1994
Created by: Dr. William M. Cornette

This SUBROUTINE sets the flags for various calculational paths.
SUBROUTINE SETUP
Created on: Mon Jan 6 14:37:32 1992
Revised on: Thu Jun 23 12:43:45 1994
Created by: Dr. William M. Cornette

This SUBROUTINE provided the inputs for the skyshine rays.

REAL FUNCTION SHADOW
Created on: Wed Nov 18 16:02:39 1992
Revised on: Tue Nov 2 10:42:47 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the self-shadowing of a rough surface.

SUBROUTINE SHNGEO
Created on: Wed Nov 18 16:02:42 1992
Revised on: Tue Nov 22 09:07:15 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the geometric parameters for the scattered solar/lunar irradiance.

SUBROUTINE SKYNOI
Created on: Wed Nov 18 16:02:46 1992
Revised on: Tue May 24 13:18:21 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines the temperature variations for the skynoise calculations.

REAL FUNCTION SLPOS
Created on: Wed Nov 18 16:02:50 1992
Created by: Dr. William M. Cornette

This FUNCTION calculates the solar or lunar positions given latitude and longitude of the sub-solar/lunar point, including the effects of refraction.
REAL FUNCTION SLCNT
Created on: Wed Nov 18 16:02:55 1992
Revised on: Tue Mar 1 07:55:46 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the exoatmospheric solar constant (W/m²).

REAL FUNCTION SLUNAR
Created on: Wed Nov 18 16:02:58 1992
Revised on: Thu Jun 23 12:43:38 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the lunar exoatmospheric irradiance (W/cm²/cm⁻¹).

SUBROUTINE SMPCAL
Created on: Wed Nov 18 16:03:02 1992
Revised on: Tue Nov 8 11:27:29 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the altitude dependent irradiance profiles for the simple solar calculations and the lunar calculations.

REAL FUNCTION SNOWEX
Created on: Wed Nov 18 16:03:07 1992
Revised on: Tue Mar 1 07:55:42 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the extinction due to falling snow at 0.55 μm.

SUBROUTINE SNOWSP
Created on: Wed Nov 18 16:03:14 1992
Revised on: Thu Jun 23 12:42:49 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the normalized (to 0.55 μm) absorption and scattering coefficients for snow.
SUBROUTINE SOIL
Created on: Wed Nov 18 16:03:16 1992
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the soil mean dielectric constant and variance by biphase mixture formula.


REAL FUNCTION SOLAR
Created on: Wed Nov 18 16:03:18 1992
Revised on: Tue Mar 1 07:55:46 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the exoatmospheric solar spectral irradiance (W/cm²/cm⁻¹).

SUBROUTINE SOLBND
Created on: Wed Nov 18 16:03:22 1992
Revised on: Tue Nov 22 09:07:17 1994
Created by: Dr. William M. Cornette

This SUBROUTINE computes the layer optical properties in the solar band and then performs the radiative transfer.

SUBROUTINE SOLRAD
Revised on: Tue Nov 22 09:07:15 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the various solar radiation parameters. It is also used for the lunar radiation parameters.
SUBROUTINE SPCLYR
Created on: Wed Nov 18 16:03:36 1992
Revised on: Thu Jun 23 12:43:49 1994
Created by: Dr. William M. Cornette

This SUBROUTINE specifies the properties of the sublayer.

REAL FUNCTION SPHAIR
Created on: Wed Jan 5 16:03:47 1995
Revised on: Tue May 2 16:38:11 1995
Created by: Dr. William M. Cornette

This FUNCTION calculates the specific heat of air as a function of water vapor content (W-sec/gm/K).

REAL FUNCTION SPHICE
Created on: Wed Nov 18 16:03:47 1992
Revised on: Mon May 17 16:42:59 1993

This FUNCTION calculates the specific heat of ice as a function of temperature (W-sec/gm/K).

REAL FUNCTION SPHWTR
Created on: Wed Nov 18 16:03:56 1992
Revised on: Mon May 17 16:42:24 1993

This FUNCTION calculates the specific heat of water as a function of temperature (W-sec/gm/K).

SUBROUTINE SPROD
Created on: Wed Nov 18 16:03:58 1992
Created by: Dr. William M. Cornette

This SUBROUTINE computes the layer diffuse flux that is produced from the solar beam using the particular solution to the two-stream approximation. (Ref. J. Jafolla, Ph.D. Thesis, 1981).
SUBROUTINE SPTRIG
Created on: Wed Nov 18 16:04:02 1992
Revised on: Tue Apr 6 16:00:03 1993
Created by: Dr. William M. Cornette

This SUBROUTINE determines the latitude and longitude of a point a given angular distance away from a reference latitude and longitude.

SUBROUTINE SRAT
Created on: Wed Nov 18 16:04:05 1992
Revised on: Thu Jun 23 12:43:42 1994
Created by: Dr. William M. Cornette

This SUBROUTINE computes the spherical atmosphere correction to the layer local zenith angle (Ref. J. Jafolla, Ph.D. Thesis, 1981).

SUBROUTINE SRCFLX
Created on: Wed Nov 18 16:04:09 1992
Revised on: Tue Nov 22 09:07:13 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the flux (up and down longwave; up, down, and beam shortwave) at the source altitude.

SUBROUTINE SRCGEO
Revised on: Tue Nov 22 09:07:16 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the geometric parameters for a point source (e.g., sun or moon).
SUBROUTINE SRCIRR
Created on: Mon Jan  6 14:37:32 1992
Revised on: Tue Nov 22 09:07:13 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the ray paths for the solar irradiance and sky/earthshine at the source.

REAL FUNCTION SRFLUX
Created on: Wed Nov 18 16:04:30 1992
Revised on: Thu Jun 23 12:43:38 1994

This FUNCTION calculates the heat flux at the surface.

SUBROUTINE SRTLAY
Created on: Wed Nov 18 16:04:37 1992
Revised on: Tue Nov 22 09:07:17 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the two stream spherical R and T values.

REAL FUNCTION STARAD
Created on: Wed Nov 18 16:04:40 1992
Revised on: Mon May 17 17:34:28 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the spectral mean space background due to stars in W/sr/cm²/cm⁻¹.

SUBROUTINE STGEOM
Revised on: Mon Nov  7 14:34:14 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the geometry index based upon an input CHARACTER string.
REAL FUNCTION STRCN2
Revised on: Mon Nov 7 14:33:58 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the index of refraction structure constant, $Cn^2$.

SUBROUTINE SUMFIL
Revised on: Tue Nov 22 09:07:03 1994
Created by: Dr. William M. Cornette

This SUBROUTINE prints out a summary of the environmental conditions represented on the main header.

REAL FUNCTION SUPK
Created on: Wed Nov 18 16:04:57 1992
Revised on: Mon Aug 2 11:06:25 1993
Created by: Dr. William M. Cornette

This FUNCTION computes the super kinetic line profile factor.

SUBROUTINE SWAT
Created by: Dr. William M. Cornette

This SUBROUTINE computes the three (up, down diffuse, down direct) stream solar band fluxes using a recursive adding technique (Ref. J. Jafolla, Ph.D. Thesis, 1981).

SUBROUTINE TANGPT
Revised on: Tue Nov 22 09:07:12 1994
Created by: Dr. William M. Cornette

This SUBROUTINE determines if a tangent point exists along a ray path. If it does, it adds the appropriate data to the arrays.
SUBROUTINE TERMPR
Revised on: Mon Nov 7 14:33:45 1994
Created by: Dr. William M. Cornette

This SUBROUTINE loads background index and establishes the projection of the solar/lunar ray on the background surface.

REAL FUNCTION THCAIR
Revised on: Tue May 2 16:38:11 1995
Created by: Dr. William M. Cornette

This FUNCTION calculates the thermal conductivity of air as a function of temperature (W/m/K).

REAL FUNCTION THCICE
Revised on: Mon May 17 16:43:20 1993

This FUNCTION calculates the thermal conductivity of ice as a function of temperature (W/m/K).

REAL FUNCTION THCSNW
Revised on: Tue Nov 2 10:42:34 1993

This FUNCTION calculates the thermal conductivity of snow as a function of density (W/m/K).

REAL FUNCTION THCWTR
Revised on: Mon May 17 16:43:16 1993

This FUNCTION calculates the thermal conductivity of water as a function of temperature (W/m/K).
SUBROUTINE TITLCR
Revised on:  Mon Nov 7 14:34:13 1994
Created by:  Dr. William M. Cornette

This SUBROUTINE creates the standard portion of the title used as part of the first record in the MOSART binary data files.

SUBROUTINE ADDARR
Revised on:  Mon Nov 7 14:34:13 1994
Created by:  Dr. William M. Cornette

DISCLAIMER: This routine was extracted from a document on how to obtain the time and date from an RS/6000 machine. It has not been tested.

The routine ADDARR is utterly stupid and should perhaps be called 'COPY'. The trick is that our program calls it by value, passing the address, and picks the result by reference, allowing access of the array. Maybe there is a smarter way of doing this, without the need of generating a new copy of the data.

REAL FUNCTION TMPCLLD
Revised on:  Thu Jun 23 12:43:48 1994
Created by:  Dr. William M. Cornette

This FUNCTION calculates the temperature of a cloud based upon its radiance.

AD   - INTEGER Variable - Cloud radiance (\mu W/cm^2/sr)

SUBROUTINE TRANLW
Revised on:  Tue Mar 1 07:55:51 1994
Created by:  Dr. William M. Cornette

This SUBROUTINE does a table look up with 2D interpolation from the Staley & Jurica tables to calculate an element TF(K,L) in the total flux transmissivity matrix. Ref. Staley, D.O., and G.M. Jurica, 1974, JAM, 9, 365-372.
SUBROUTINE TRNSMT
Revised on: Mon Nov 7 14:33:57 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the total transmittance and the transmittance due to absorption.

SUBROUTINE TURBUL
Revised on: Wed Jun 15 14:01:02 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the turbulence parameters.

REAL FUNCTION UDIF
Created on: Wed Nov 18 15:45:33 1992
Created by: Dr. William M. Cornette

This FUNCTION calculates the three layer composite upward diffuse flux from solar beam given individual layer upward diffuse from solar fluxes and two-stream reflection and transmission functions.

SUBROUTINE UDLAY
Created on: Wed Nov 18 15:45:36 1992
Revised on: Tue Nov 22 09:07:16 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the diffuse upper and lower reflectances using a three-stream radiative transfer methodology.

CHARACTER(*) FUNCTION UPCASE
Created by: Dr. William M. Cornette
Created on: Tue Jul 28 14:49:15 1992
Revised on: Mon Aug 2 11:06:27 1993

This FUNCTION converts STRING from lower case to upper case.
SUBROUTINE USRBCK
Created on: Wed Nov 18 15:45:52 1992
Revised on: Tue Nov 22 09:07:06 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads the user-defined background file and loads the appropriate arrays.

SUBROUTINE USRCLD
Created on: Wed Nov 18 15:45:59 1992
Revised on: Tue Nov 22 09:07:06 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads in the user-defined hydrometeor file.

SUBROUTINE USRDEF
Created on: Wed Nov 18 15:45:56 1992
Revised on: Tue Nov 22 09:07:12 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads in the user-defined atmospheric parameters.

REAL FUNCTION VIRIAL
Revised on: Tue May 2 16:38:11 1995
Created by: Dr. William M. Cornette

This SUBROUTINE determines the second and third virial coefficients for moist air.

REAL FUNCTION VISRH
Created on: Wed Nov 18 15:44:44 1993
Revised on: Mon Apr 25 08:35:00 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the meteorological range in km based upon the relative humidity, based on Hanel (1972).
SUBROUTINE VSA
Revised on: Tue May 24 13:17:44 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the vertical structure profile of aerosol density near the ground, including clouds and fog, at 9 altitudes between 0 and 2 km.

REAL FUNCTION XMCONV
Revised on: Thu Jun 23 12:43:29 1994
Created by: Dr. William M. Cornette

This FUNCTION converts the various types of units for molecular concentrations to ppmv.

SUBROUTINE XPNDAR
Revised on: Mon May 17 16:43:07 1993
Created by: Dr. William M. Cornette

This SUBROUTINE expands a partially filled array. The part of the array that has been filled must be ordered in X.

REAL FUNCTION XTERP
Created by: Dr. William M. Cornette

This FUNCTION performs interpolation on the function Y(X) to determine the value Y(X0). The search for the adjacent points in X(I) to the value X0 starts at X(KEY). If X0 falls outside the range of X(I), then either the value X(1) or X(N) is used, depending on whether X0 is less than X(1) or greater than X(N), respectively.
REAL FUNCTION ZLAT
Created by: Dr. William M. Cornette

This FUNCTION determines the zodiacal latitude.

REAL FUNCTION ZODICL
Revised on: Tue Jun 28 08:00:22 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the zodiacal light, employing a Lorentzian dust distribution. The radiance is calculated as a function of wavelength and geocentric ecliptic elongation and latitude.

SUBROUTINE ZROHDR
Revised on: Tue Nov 22 09:07:12 1994
Created by: Dr. William M. Cornette

This SUBROUTINE zeros the MOSART file header.

SUBROUTINE ZROINT
Created by: Dr. William M. Cornette

This SUBROUTINE zeroes the summation variables for the spectral integration.

WRAPPER:

C Language Wrapper for the MOSART Code

CLEAR:

This routine is for use on a Sun computer to suppress the warning messages for Inexact and Underflow conditions.
3.2 Block Data Modules

The BLOCK DATA modules contained in the MOSART program are listed below in alphabetical order. A brief description and the Creation Date and the Revision Date are provided for each module.

BLOCK DATA ARSABD
Created on: Wed Nov 18 16:06:03 1992
Revised on: Tue May 4 12:03:52 1993
Created by: Dr. William M. Cornette

This BLOCK DATA module contains the model aerosols absorption coefficients.

BLOCK DATA ARSLBD
Created on: Wed Nov 18 16:06:03 1992
Revised on: Tue May 4 12:03:07 1993
Created by: Dr. William M. Cornette

This BLOCK DATA module contains the model aerosols.

BLOCK DATA ARSXBD
Created on: Wed Nov 18 16:06:03 1992
Revised on: Tue May 4 12:03:55 1993
Created by: Dr. William M. Cornette

This BLOCK DATA module contains the model aerosols extinction coefficients.

BLOCK DATA ATMSBD
Created on: Wed Nov 18 16:06:07 1992
Revised on: Tue May 24 13:17:40 1994
Created by: Dr. William M. Cornette

This BLOCK DATA module contains the data for the model Atmospheres.
This BLOCK DATA module contains all of the parameters for the earth background materials.

This BLOCK DATA module contains the parameters for the temperature-dependent background stratospheric aerosol model.

This BLOCK DATA module provides the various constants for the broad-band, heat transfer calculations.

This BLOCK DATA module provides the cross-sections for the chloro-fluorocarbons.

This BLOCK DATA module contains miscellaneous CHARACTER strings.
BLOCK DATA CIRRBD
Created by:  Dr. William M. Cornette

This BLOCK DATA module contains the asymmetry factors for the cirrus cloud models.

BLOCK DATA CLDRBD
Created on:  Wed Nov 18 16:06:35 1992
Revised on:  Tue May 4 09:13:21 1993
Created by:  Dr. William M. Cornette

This module contains the cloud and rain data bases.

BLOCK DATA CROSBD
Created by:  Dr. William M. Cornette

This BLOCK DATA contains the cross-sections of various molecules for which band parameters are not available.

BLOCK DATA DEVCBD
Revised on:  Tue Nov 22 09:07:04 1994
Created by:  Dr. William M. Cornette

This BLOCK DATA module assigns file unit numbers for all files.

BLOCK DATA DSRTBD
Created on:  Wed Nov 18 16:06:51 1992
Revised on:  Mon Jul 5 11:41:48 1993
Created by:  Dr. William M. Cornette

This BLOCK DATA module contains the desert aerosol extinction coefficients, absorption coefficients, and asymmetry parameters for four wind speeds: 0 m/sec, 10 m/sec, 20 m/sec, and 30 m/sec.
This BLOCK DATA contains the labels and conversions for the World Ecosystems (WE1.4D) data base, based on the Olson World Ecosystem Classes Version 1.4D. The data is a 10-minute GED grid with a mixed resolution of 10 to 30 minute. The positional error is unknown. Although there are 74 categories, 15 categories are not used, and two (2) categories are empty (i.e., City complexes CCX and Broadleaf Evergreen ScrUB BES).

This BLOCK DATA module contains the descriptions of various materials.

This BLOCK DATA module contains the data for the non-latitude dependent molecular profiles.

This BLOCK DATA contains the Gauss-Legendre coefficients.
This BLOCK DATA module contains the parameters for the self-broadened correction to the water vapor continuum at 260 K and 296 K.

This BLOCK DATA module contains the haze profiles.

This BLOCK DATA module provides the real and imaginary indices of refraction for ice.

This BLOCK DATA contains a sample filter response spectral data file. The data contained in this sample file is for the photopic response of the human eye.

This BLOCK DATA module contains a sample input file.
This BLOCK DATA module contains the abscissas and weights for Laguerre integration. Also provided is the product of the weights, WLG, and the exponential of the abscissa, XLG, namely, WLGEX.

This BLOCK DATA module contains the lunar perturbations data selected from the Table of Motion of the Moon by Ernest W. Brown.

This BLOCK DATA module contains the Navy Marine aerosol extinction and absorption data.

This BLOCK DATA contains the names of the different molecules, aerosols, hydrometeors, and the like.
This BLOCK DATA module contains the data for the molecular partition functions.

This BLOCK DATA contains the cross-sections of NO₂ between 14095 and 49970 cm⁻¹.

This BLOCK DATA module contains the parameters for the oxygen continuum.

This BLOCK DATA modules contains the Herzberg and Schumann-Runge O₂ band model.

This BLOCK DATA contains the cross-sections of the Chappuis and Wulf band of O₃ between 9170 and 24565 cm⁻¹.
This BLOCK DATA module contains the data for the ozone Hartley Huggins cross-sections for a temperature of 273 K. The units are of

The data now includes Molina & Molina data at 273 K with the temperature dependence determined from the 195 K Harvard measurements employing the Bass algorithm, C0*(1+C1*T+C2*(T**2)). This is only for the wavelength range from 0.34 to 0.35 microns. Otherwise, the Bass data alone have been employed between 0.245 and 0.34 microns.

This BLOCK DATA module contains the ocean temperatures the surface for four seasons of the year. A temperature of zero (0.0) implies that only terrain exists in the 5 deg by 5 deg resolution cell.

This BLOCK DATA module contains the phase functions for the fog models.

This BLOCK DATA module contains the phase functions for the hydrometeor models.
This BLOCK DATA module contains the phase functions for the relative humidity dependent boundary layer maritime aerosol.

This BLOCK DATA module contains the phase functions for the relative humidity dependent boundary layer oceanic aerosol.

This BLOCK DATA module contains the phase functions for the relative humidity dependent boundary layer rural aerosol.

This BLOCK DATA module contains the phase functions for all stratospheric were extrapolated exponentially for 65 angles.
This BLOCK DATA module contains the phase functions for the relative humidity dependent tropospheric aerosol.

This BLOCK DATA module contains the phase functions for the relative humidity dependent boundary layer urban aerosol.

This BLOCK DATA module contains the rain and snow model data.

This BLOCK DATA modules contains the parameters for the refractivity from 10 to 1000 GHz for H2O vapor and O2.

This BLOCK DATA module contains all of the parameters for the earth background scenes.
This BLOCK DATA module contains the sea ice indices.

This BLOCK DATA module contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 100 and 10,000 cm\(^{-1}\).

This BLOCK DATA module contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 10,001 and 20,000 cm\(^{-1}\).

This BLOCK DATA module contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 20,001 and 30,000 cm\(^{-1}\).

This BLOCK DATA module contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 30,001 and 40,000 cm\(^{-1}\).
BLOCK DATA SLR5BD
Created on: Wed Nov 18 16:10:19 1992
Revised on: Thu Apr 13 17:35:48 1995
Created by: Dr. William M. Cornette

This BLOCK DATA module contains the spectral irradiance of the sun at the earth for the mean earth-sun distance above 40,001 cm\(^{-1}\).

BLOCK DATA SNOWBD
Created on: Wed Nov 18 16:10:12 1992
Created by: Dr. William M. Cornette

This BLOCK DATA module contains the parameters for snow.

BLOCK DATA SO2BD
Revised on: Tue May 24 13:18:15 1994
Created by: Dr. William M. Cornette

This BLOCK DATA contains the cross-sections of SO2 between 24820 and 52625 cm\(^{-1}\).

BLOCK DATA STMLBD
Created by: Dr. William M. Cornette

This BLOCK DATA module contains the data for the latitude dependent molecular profiles.

BLOCK DATA UFTPBD
Created on: Thu Sep 22 1993
Revised on: Tue Mar 1 07:55:50 1994
Created by: Dr. William M. Cornette

This BLOCK DATA contains the pointer information for the MODTRAN molecular data base file 'UFTAPE'.
BLOCK DATA UPPRBD
Revised on: Tue May 24 13:17:39 1994
Created by: Dr. William M. Cornette

This BLOCK DATA contains the atmospheric profile above 100 km altitude.

BLOCK DATA VIRLBD
Created on: Wed Nov 18 16:10:45 1992
Revised on: Tue May 2 16:38:10 1995
Created by: Dr. William M. Cornette

This BLOCK DATA module contains the virial coefficients for dry air, vapor, and the interaction coefficient as a function of temperature.

BLOCK DATA WTRBD
Created on: Wed Nov 18 16:10:52 1992
Created by: Dr. William M. Cornette

This BLOCK DATA module contains the index of refraction for water.

BLOCK DATA ZOD1BD
Revised on: Tue May 4 09:12:03 1993
Created by: Dr. William M. Cornette

This BLOCK DATA module contains the first set of the zodiacal light parameters.

BLOCK DATA ZOD2BD
Revised on: Tue Mar 1 07:55:47 1994
Created by: Dr. William M. Cornette

This BLOCK DATA module contains the second set of zodiacal light parameters.
3.3 ASCBIN

The routines contained in the ASCBIN program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

PROGRAM ASCBIN
Created on: Tue Sep 25 09:40:01 1990
Revised on: Tue Nov 22 09:07:01 1994
Created by: Dr. William M. Cornette

MOSART ASCII from Binary Computer Code.

SUBROUTINE CONVAB
Created on: Tue Sep 25 09:41:05 1990
Revised on: Tue Nov 29 10:37:17 1994
Created by: Dr. William M. Cornette

This SUBROUTINE converts an MOSART binary data file into an ASCII data file. It also converts the ASCII data file into an MOSART binary file.

SUBROUTINE SETFIL
Created by: Dr. William M. Cornette

This SUBROUTINE checks for the existence of a file, and if it exists, it OPENs the file.

SUBROUTINE SLITFN
Created on: Fri Nov 20 12:05:04 1992
Revised on: Thu Jun 30 11:12:28 1994
Created by: Dr. William M. Cornette

This SUBROUTINE initializes the slit function variables and then step-wise convolves the input parameter with the slit function weights.
This SUBROUTINE provides the spectral data in an MOSART source binary data file in a tabular form.

This SUBROUTINE provides the spectral data in an MOSART background binary data file in a tabular form.

This SUBROUTINE provides the temporal data in an MOSART heat transfer binary data file in a tabular form.

This SUBROUTINE provides the spectral data in an MOSART molecular transmittance binary data file in a tabular form.

3.4 BBTEMP

The routines contained in the BBTEMP program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.
PROGRAM BBTEMP
Created on: Thu Jul 2 11:49:18 1992
Revised on: Tue Nov 22 09:07:06 1994
Created by: Dr. William M. Cornette

Blackbody Temperature Summary Program.

This PROGRAM reads the '.atm' binary data file from MOSART and convert the radiance values to equivalent blackbody temperatures (K).

REAL FUNCTION INVLPLK
Created on: Thu Jul 2 11:49:21 1992
Revised on: Fri Mar 26 16:06:00 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the temperature corresponding to the spectral blackbody curve (Planck function).

3.5 CRFILE

The routines contained in the CRFILE program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section. Except for the driver routines, MSAG and MDRI, the components of the SAG code are not provided.

SUBROUTINE CNVJTK
Created on: Wed Nov 18 16:00:30 1992
Revised on: Tue Apr 5 17:30:17 1994
Created by: Dr. William M. Cornette

This SUBROUTINE converts the MODTRAN JCHAR string to the MOSART indexing scheme.
SUBROUTINE CRBKGD
Created on: Tue Sep 25 09:41:02 1990
Revised on: Tue Mar 1 07:47:02 1994
Created by: Dr. William M. Cornette

This SUBROUTINE creates the MOSART user-defined background data file.

PROGRAM CRFILE
Created on: Tue Sep 25 09:40:01 1990
Revised on: Tue Nov 22 09:07:05 1994
Created by: Dr. William M. Cornette

SUBROUTINE CRFLTR
Created on: Tue Sep 25 09:40:16 1990
Created by: Dr. William M. Cornette

This SUBROUTINE creates the MOSART filter response file.

SUBROUTINE CRINPT
Created on: Tue Sep 25 09:39:58 1990
Revised on: Tue Nov 22 09:07:00 1994
Created by: Dr. William M. Cornette

This SUBROUTINE creates the MOSART input file.

SUBROUTINE CRUAER
Created on: Tue Sep 25 09:40:55 1990
Revised on: Tue Nov 2 10:43:27 1993
Created by: Dr. William M. Cornette

This SUBROUTINE creates the MOSART user-defined aerosol data file.
SUBROUTINE CRUATM
Created on: Tue Sep 25 09:40:13 1990
Revised on: Tue Nov 22 09:06:59 1994
Created by: Dr. William M. Cornette

This SUBROUTINE creates the MOSART user-defined atmosphere data file.

SUBROUTINE CRUCLD
Created on: Tue Sep 25 09:40:52 1990
Revised on: Tue Nov 2 10:43:25 1993
Created by: Dr. William M. Cornette

This SUBROUTINE creates the MOSART user-defined hydrometeor data file.

BLOCK DATA INARBD
Revised on: Sat Jun 18 13:09:45 1994
Created by: Dr. William M. Cornette

This BLOCK DATA contains a sample user-defined aerosol file.

BLOCK DATA INBKBD
Created on: Fri Mar 30 14:49:35 1990
Revised on: Sat Jun 18 13:09:44 1994
Created by: Dr. William M. Cornette

This BLOCK DATA contains a sample user-defined background and scene file.

BLOCK DATA INCLBD
Revised on: Sat Jun 18 13:09:43 1994
Created by: Dr. William M. Cornette

This BLOCK DATA contains a sample user-defined hydrometeor file.
SUBROUTINE MDRI
Created on: 6 July 1994
Created by: Dr. William M. Cornette

This SUBROUTINE has been modified to operate with CRFILE for MOSART user-defined files.

SUBROUTINE MENU
Created on: Mon Jul 23 11:24:00 1990
Revised on: Tue Mar 1 07:47:01 1994
Created by: Dr. William M. Cornette

This SUBROUTINE provides the keys and indices for the input to the MOSART code.

SUBROUTINE MSAG
Created on: Tue Mar 29 15:44:44 1994
Revised on: Mon Nov 7 14:34:13 1994
Created by: Dr. William M. Cornette

This SUBROUTINE drives the SHARC/SAMM Atmosphere Generator for use by MOSART.

BLOCK DATA NRLBD
Created on: 6 July 1994
Revised on: Mon Nov 7 14:34:13 1994
Created by: Dr. William M. Cornette

This BLOCK DATA contains the file number and names of the NRL data bases.

SUBROUTINE RDMDTN
Created on: Wed Nov 18 16:00:30 1992
Revised on: Tue Nov 22 09:06:59 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads a MODTRAN input file and creates an equivalent (at least approximately) MOSART input file.
3.6 FACET

The routines in the FACET program are listed below in alphabetical order, together with a brief description and the Creation Date and Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

PROGRAM FACET
Created on: Thu Jun 23 12:36:15 1992
Revised on: Tue Nov 22 09:07:05 1994
Created by: Dr. William M. Cornette

This PROGRAM computes the emitted and reflected radiances from a unit area flat plate. Emissivities can be either

- Lambertian (diffuse) or
- directional,

depending upon the available data. Reflectivities can be either

- Lambertian (diffuse),
- directional, or
- bidirectional,

depending upon the available data. The emissivity and reflectivity are related as follows:

<table>
<thead>
<tr>
<th>Emissivity</th>
<th>Reflectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diffuse</td>
</tr>
<tr>
<td>Diffuse</td>
<td>x</td>
</tr>
<tr>
<td>Directional</td>
<td></td>
</tr>
</tbody>
</table>

REAL FUNCTION ROUGH
Revised on: Mon Nov  7 14:34:13 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the amount of energy reflected specularly from a rough surface. Losses are due to incoherent scattering and interference.
REAL FUNCTION SURFAC
Revised on: Mon Nov 7 14:34:15 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the facet element radiance.

3.7 FPTEST

The routines contained in the FPTEST program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

SUBROUTINE CKSTAT
Created on: Mon Aug 2 11:06:44 1993
Revised on: Thu Jun 23 12:43:48 1994
Created by: Dr. William M. Cornette

This SUBROUTINE checks for whether a code is running in static or dynamic mode and at what uninitialized variables are set.

REAL FUNCTION ZSTAT

LOGICAL FUNCTION FLCOL1
Created on: Thu Oct 28 1993
Revised on: Tue Nov 2 10:43:32 1993
Created by: Dr. William M. Cornette

This FUNCTION determines if a file written by the code can then be read by the code, or if column one is suppressed. A value of .TRUE. implies that the code can read a file that it has written.

PROGRAM FPTEST
Created on: Tue Sep 15 1992
Revised on: Tue Nov 22 09:07:06 1994
Created by: Dr. William M. Cornette

This PROGRAM tests certain numerical algorithms for calculating key floating point parameters that are machine dependent.
FUNCTION LRECHK

This FUNCTION calculates the record length for different length and type of records. Duplicate methods for declaring variables (e.g., REAL and REAL*4, DOUBLE COMPLEX and COMPLEX*16) are declared in the more conventional method, with the alternate method commented out. Also, non-ANSI standard variable types (e.g., LOGICAL*1, INTEGER*1) are also commented out. Each type is commented out with the following abbreviations:

"CINT1" for INTEGER*1
"CINT4" for INTEGER*4
"CRL4" for REAL*4
"CRL8" for REAL*8
"CCM6" for COMPLEX*8
"CCM16" for COMPLEX*16
"CLOG2" for LOGICAL*2
"CLOG4" for LOGICAL*4
"CIBM" for IBM
"CUNV" for Univac
"CDBL" for the INTRINSICs DCMPLX and DIMAG

3.8 INSTDB

The routines contained in the CRFILE program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

PROGRAM INSTDB
Created on: Thu Jul 2 09:36:53 1992
Revised on: Tue Nov 22 09:07:02 1994
Created by: Dr. William M. Cornette

This PROGRAM installs the MOSART data bases.

Note: To OPEN the direct access files on an IBM VM/CMS operating system, certain file parameters must be set. Remove the occurrences of 'CIBMV' below.
3.9 MRFLTR

The routines contained in the MRFLTR program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

SUBROUTINE ATMINT
Revised on: Tue Nov 22 09:07:05 1994
Created by: Dr. William M. Cornette

This SUBROUTINE integrates the spectral data from the source file.

SUBROUTINE ATMOUT
Revised on: Tue Nov 22 09:07:04 1994
Created by: Dr. William M. Cornette

This SUBROUTINE prints out the atmospheric parameters.

SUBROUTINE BCKINT
Created on: Wed Nov 18 15:41:30 1992
Revised on: Tue Nov 22 09:07:05 1994
Created by: Dr. William M. Cornette

This SUBROUTINE integrates the background spectral data.

SUBROUTINE GETHDR
Revised on: Tue Nov 22 09:07:11 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads the MOSART file header into the COMMON block HEADER.
PROGRAM MRFLTR
Revised on: Tue Nov 22 09:07:04 1994
Created by: Dr. William M. Cornette

MOSART Spectral Filter Response Convolution Code.

3.10 PLTGEN

The routines contained in the PLTGEN program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

SUBROUTINE AGUTOL
Created by: Dr. William M. Cornette

This SUBROUTINE is used by the NCAR graphics package for mapping the various axis.

CHARACTER*(*) FUNCTION APPEND
Revised on: Thu Jun 23 12:43:36 1994
Created by: Dr. William M. Cornette

This FUNCTION appends STRNG2 at the end of the non-blank portion of STRNG1.

BLOCK DATA PLTBD
Revised on: Wed Jun 15 14:01:07 1994
Created by: Dr. William M. Cornette

This BLOCK DATA contains the standard plot parameter definition for all plot types.
SUBROUTINE PLTDRV
Created on: Thu Nov 15 10:59:11 1990
Revised on: Tue Nov 22 09:07:11 1994
Created by: Dr. William M. Cornette

This SUBROUTINE is the driver for setting up the plots.

PROGRAM PLTGEN
Created on: Tue Sep 25 09:40:50 1990
Revised on: Tue Nov 22 09:07:11 1994
Created by: Dr. William M. Cornette

This PROGRAM initializes plotting with installation specific routines. Please refer to the installation instructions for customizing for a specific installation. This PROGRAM is the driver for the NCAR graphics package.

SUBROUTINE RDMSRT
Revised on: Tue Nov 22 09:07:11 1994
Created by: Dr. William M. Cornette

This SUBROUTINE reads in the MOSART .atm binary output file. The file is OPENed outside the SUBROUTINE by the main driver.

3.11 VISUAL

The routines contained in the VISUAL program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

SUBROUTINE COLOR
Created on: Thu Jul 2 09:12:48 1992
Revised on: Fri Mar 26 16:14:42 1993
Created by: Dr. William M. Cornette

This SUBROUTINE determines the human eye color response.
SUBROUTINE HUMAN
Created on: Thu Jul 2 09:12:55 1992
Revised on: Mon Aug 2 09:57:22 1993
Created by: Dr. William M. Cornette

This FUNCTION determines the spectral lumen/watt response of the human eye, based on available background illumination.

SUBROUTINE NRMLZ
Created on: Thu Jul 2 09:12:58 1992
Revised on: Fri Mar 26 16:14:34 1993
Created by: Dr. William M. Cornette

This SUBROUTINE normalizes the terms X and Y by the sum X+Y+Z.

SUBROUTINE SUMIT
Created on: Thu Jul 2 09:13:07 1992
Revised on: Thu Jun 23 12:43:50 1994
Created by: Dr. William M. Cornette

This SUBROUTINE performs an incremental integration of the variable RV over the spectral interval DV for the weights FILTER, X, Y, and Z.

PROGRAM VISUAL
Created on: Thu Jul 2 11:49:56 1992
Revised on: Tue Nov 22 09:07:04 1994
Created by: Dr. William M. Cornette

This PROGRAM reads the '.atm' binary data file from APART for the human visual response region of the spectrum (0.34 - 0.78 microns), determines the appropriate eye spectral response (i.e., photopic, scotopic, or mesopic), calculates the environmental parameters in lumen and evaluates the color content of the parameters.
3.12 FACET

PROGRAM FACET
Created on: Thu Jan 23 12:36:15 1992
Revised on: Thu Apr 13 17:47:29 1995
Created by: Dr. William M. Cornette

This PROGRAM computes the emitted and reflected radiances from a unit area flat plate. Emissivities can be either

- Lambertian (diffuse) or
- directional,

depending upon the available data. Reflectivities can be either

- Lambertian (diffuse),
- directional, or
- bidirectional,

depending upon the available data. The emissivity and reflectivity are related as follows:

<table>
<thead>
<tr>
<th>Emissivity</th>
<th>Reflectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffuse</td>
<td>Bidirectional</td>
</tr>
<tr>
<td>Directional</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

REAL FUNCTION ROUGH
Revised on: Mon Nov 7 14:34:13 1994
Created by: Dr. William M. Cornette

This FUNCTION calculates the amount of energy reflected specularly from a rough surface. Losses are due to incoherent scattering and interference.
REAL FUNCTION SURFAC
Revised on: Mon Nov 7 14:34:15 1994
Created by: Dr. William M. Cornette

This SUBROUTINE calculates the facet element radiance.

3.13 SCNGEN

SUBROUTINE COEFF
Created on: Thu Jul 2 08:59:07 1992
Revised on: Thu Feb 2 13:30:26 1995
Created by: Dr. William M. Cornette

This SUBROUTINE generates the Fourier coefficients for the scene by using random numbers scaled by the PSD. Since the resulting scene is real valued, half of the complex Fourier coefficients are redundant and only half the array space is required.

REAL FUNCTION CORF
Created on: Thu Jul 2 08:59:10 1992
Revised on: Mon Aug 2 09:56:46 1993
Created by: Dr. William M. Cornette

This FUNCTION returns the spatial correlation function given the correlation length (defined as the correlation function at 1/e), the PSD frequency scale and the PSD power law index.

SUBROUTINE FM2D
Created on: Thu Jul 2 08:59:12 1992
Revised on: Fri Mar 26 16:12:17 1993
Created by: Dr. William M. Cornette

This SUBROUTINE performs a midpoint displacement and successive random additions in two dimensions.
SUBROUTINE FOUR1
Created on: Thu Jul 2 08:59:15 1992
Revised on: Thu Feb 2 13:30:06 1995
Created by: Dr. William M. Cornette

This SUBROUTINE performs the Cooley-Tukey Fast Fourier Transform.

\[ \text{TRANSFM}(K) = \sum \text{PDATA}(J) \times \exp(i \cdot \text{SIGN} \times 2 \times \text{PI} \times \text{SQRT}(-1) \times (J-1) \times (K-1)/\text{NN}), \]

summed over all J and K from 1 to NN. The rms relative error is bounded by
\[ 6 \times \text{SQRT}(2) \times \text{LOG2}(\text{NN}) \times 2^{-B}, \]
where B is the number of bits in the floating point fraction.

The output has the form such that the 1st (complex) value corresponds to 0 freq,
the next to + DELF, up to \((N/2 - 1)\) DELF, then \(-N/2\) DELF to the last entry
corresponding to \(-\text{DELF}\), where \(\text{DELF}=1/\text{NN}\).

REAL FUNCTION GAMMA
Created on: Thu Jul 2 08:59:17 1992
Revised on: Mon Aug 2 09:56:51 1993
Created by: Dr. William M. Cornette

This FUNCTION returns the gamma function of the argument for values of the
argument greater than zero. It uses the polynomial approximation from the
Handbook of Mathematical Functions (9th Dover printing) by Abramowitz and
Stegun (page 257, 6.1.35).

REAL FUNCTION GAUS
Created on: Thu Jul 2 08:59:19 1992
Revised on: Mon Aug 2 09:56:50 1993
Created by: Dr. William M. Cornette

This FUNCTION produces Gaussian random numbers having the specified standard
deviation by adding and scaling 12 uniform random numbers. The sum of 12
uniformly distributed random numbers on \((a,-a)\) has standard deviation \(= 2a\).
REAL FUNCTION KNU
Created on: Thu Jul 2 08:59:22 1992
Revised on: Mon Aug 2 09:56:43 1993
Created by: Dr. William M. Cornette

This FUNCTION returns the modified Bessel function K for values of the index greater than 0.5. It numerically evaluates an integral expression from The Handbook of Mathematical Functions (9th Dover edition) by Abramowitz and Stegun (page 376, 9.6.23). Accuracy is about three places.

SUBROUTINE RUNIF
Created on: Thu Jul 2 08:59:27 1992
Revised on: Fri Mar 26 16:11:55 1993
Created by: Dr. William M. Cornette

This FUNCTION is a random number generator that returns a value between 0. and 0. It is portable among a wide variety of computers. It generates a random number between 0.0 and 1.0 according to the algorithm presented by Bays and Durham (TOMS, 2, 59, 1976). The motivation for using this scheme, which resembles the Maclaren-Marsaglia method, is to greatly increase the period of the random sequence. If the period of the basic generator (UNI) is P, then the expected mean period of the sequence generated by RUNIF is given by new mean

\[ P = \text{SQRT}(\text{PI*FACTORIAL(N)}/(8^*P)) , \]

where FACTORIAL(N) must be much greater than P in this asymptotic formula. Generally, N should be around 32 if P=4.E6 as for UNI.

This routine was modified from a routine written by W. Fullerton (LANL).
REAL FUNCTION SCALE
Created on: Thu Jul 2 08:59:29 1992
Revised on: Mon Aug 2 09:56:48 1993
Created by: Dr. William M. Cornette

This FUNCTION returns the frequency scale required for specification of the 1-dimensional PSD from the spatial correlation length and the power law index by using the Fourier transform relationship between the PSD and the correlation function. The correlation length is defined as the correlation function evaluated at 1/e. The algorithm evaluates the correlation function for various values of the frequency scale until the condition is satisfied.

PROGRAM SCNGEN
Created on: Thu Jul 2 08:59:38 1992
Revised on: Tue May 9 10:03:10 1995
Created by: Dr. William M. Cornette

This PROGRAM computes a 1024 x 1024 2-dimensional scene containing correlated random fluctuations described by a set of specified 1-dimensional PSDs. It is assumed that the fluctuations in the 2-dimensional scene are isotropic. Each PSD is completely described by a material correlation length, material scene variance, and material power law slope for each material in the scene. Different values of the input random number seed will produce statistically independent realizations of the scene. The 1-dimensional PSD for each material has the form,

\[ \text{PSD}(KX) = 2. \cdot \text{SQRT}(\pi) \cdot \text{VAR} \cdot (\text{GAMMA}((\text{ALPHA}/2.)/\text{GAMMA}((\text{ALPHA}-1.)/2.))) \]
\[ / (K0^*(1.+(KX/K0)^**2)**(\text{ALPHA}/2.)) \]

while the 2-dimensional PSD for each material has the form:

\[ \text{PSD2D} = 2. \cdot \text{PI} \cdot \text{VAR} / (K0X*K0Y)^* \]
\[ ((1.+(KX/K0X)^**2+(KY/K0Y)^**2)**(-(\text{ALPHA}+1.)/2.)) \]
SUBROUTINE TDFFT
Created on: Thu Jul 2 08:59:41 1992
Revised on: Fri Mar 26 16:11:49 1993
Created by: Dr. William M. Cornette

This SUBROUTINE performs an in-place 2-dimensional FFT on the packed complex Fourier coefficients generated in COEFF and produces the real valued scene. It first partially unpacks the coefficients by creating one extra row in array UNPCK.

SUBROUTINE TILEIT
Revised on: Thu Feb 2 13:30:26 1995
Created by: Dr. William M. Cornette

This SUBROUTINE tiles a larger array using the results from a smaller array, with a smooth transition at the edges.

REAL FUNCTION UNI
Created on: Thu Jul 2 08:59:43 1992
Revised on: Fri Mar 26 16:11:46 1993
Created by: Dr. William M. Cornette

This FUNCTION is a pseudo-random number generator that produces numbers between 0. and 1. This code is portable among a wide variety of computers. UNI(R) undoubtedly is not as good as many readily available installation dependent versions, and so this routine is not recommended for widespread usage. Its redeeming feature is that the exact same random numbers (to within final round-off error) can be generated from machine to machine. Thus, programs that make use of random numbers can be easily transported to and checked in a new environment. The random numbers are generated by the linear congruential method described, e.g., by Knuth in Seminumerical Methods (pg. 9), Addison-Wesley, 1969. Given the l-th number of a pseudo-random sequence, the l+1 -st number is generated from

\[ X(l+1) = (A \times X(l) + C) \mod M, \]

where here \( M = 2 \times 22 = 4194304 \), \( C = 1731 \) and several suitable values of the multiplier A are discussed below. Both the multiplier A and random number X are represented in double precision as two 11-bit words. The constants are chosen so that the period is the maximum possible, 4194304. In order that the same numbers be generated from machine to machine, it is necessary that 23-bit integers be
reducible modulo $2^{11}$ exactly, that 23-bit integers be added exactly, and that
11-bit integers be multiplied exactly. Furthermore, if the restart option is used
(where $R$ is between 0 and 1), then the product $R * 2^{22} = R * 4194304$ must be
correct to the nearest integer. The first four random numbers should be
0.0004127026, 0.6750836372, 0.1614754200, and 0.9086198807. The tenth
random number is 0.5527787209, and the hundredth is 0.3600893021. The
thousandth number should be 0.2176990509. In order to generate several
effectively independent sequences with the same generator, it is necessary to know
the random number for several widely spaced calls. The $I$-th random number times
$2^{22}$, where $I=K*P/8$ and $P$ is the period of the sequence ($P = 2^{22}$), is still of the
form $L*P/8$. In particular, we find the $I$-th random number multiplied by $2^{22}$ is
given by

\[
I = 0 \ 1*P/8 \ 2*P/8 \ 3*P/8 \ 4*P/8 \ 5*P/8 \ 6*P/8 \ 7*P/8 \ 8*P/8 \\
UNI = 0 \ 5*P/8 \ 2*P/8 \ 7*P/8 \ 4*P/8 \ 1*P/8 \ 6*P/8 \ 3*P/8 \ 0
\]

Thus the $4*P/8 = 2097152$ random number is 2097152/2^{22}. Several multipliers
have been subjected to the spectral test (see Knuth, p. 82). Four suitable
multipliers roughly in order of goodness according to the spectral test are

\[
3146757 = 1536 * 2048 + 1029 = 2^{21} + 2^{20} + 2^{10} + 5 \\
2098181 = 1024 * 2048 + 1029 = 2^{21} + 2^{10} + 5 \\
3146245 = 1536 * 2048 + 517 = 2^{21} + 2^{20} + 2^9 + 5 \\
2776669 = 1355 * 2048 + 1629 = 5^9 + 7^7 + 1
\]

In the table below LOG10(NU(I)) gives roughly the number of random decimal digits
in the random numbers considered $I$ at a time.

C is the primary measure of goodness. In both cases bigger is better.

<table>
<thead>
<tr>
<th>A</th>
<th>I=2</th>
<th>I=3</th>
<th>I=4</th>
<th>I=5</th>
<th>C(I)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I=2</td>
<td>I=3</td>
<td>I=4</td>
<td>I=5</td>
<td>I=2</td>
</tr>
<tr>
<td>3146757</td>
<td>3.3</td>
<td>2.0</td>
<td>1.6</td>
<td>1.3</td>
<td>3.1</td>
</tr>
<tr>
<td>2098181</td>
<td>3.3</td>
<td>2.0</td>
<td>1.6</td>
<td>1.2</td>
<td>3.2</td>
</tr>
<tr>
<td>3146245</td>
<td>3.3</td>
<td>2.2</td>
<td>1.5</td>
<td>1.1</td>
<td>3.2</td>
</tr>
<tr>
<td>2776669</td>
<td>3.3</td>
<td>2.1</td>
<td>1.6</td>
<td>1.3</td>
<td>2.5</td>
</tr>
<tr>
<td>Best Possible</td>
<td>3.3</td>
<td>2.3</td>
<td>1.7</td>
<td>1.4</td>
<td>3.6</td>
</tr>
</tbody>
</table>

This code has been modified from a code developed by W. Fullerton (LANL).
3.14 TERTEM

INTEGER FUNCTION NCHTER
Revised on: Tue May 9 10:03:08 1995
Created by: Dr. William M. Cornette

This FUNCTION determines the terrain material index from a CHARACTER argument. For example, if the CHARACTER argument is either 'ASPHALT', 'Asphalt', 'asphalt', or '64 ', the function returns the value of 64 for Asphalt.

SUBROUTINE RDUSRM
Revised on: Tue May 9 10:03:11 1995
Created by: Dr. William M. Cornette

This SUBROUTINE reads in and initializes user-defined terrain materials for TERTEM.

PROGRAM TERTEM
Revised on: Fri May 26 15:32:25 1995
Created by: Dr. William M. Cornette

This PROGRAM calculates the terrain material temperatures for the GENESIS code.
4.0 ROUTINE DATA DICTIONARY

4.1 MOSART Routines

The data dictionaries for the executable routines and BLOCK DATA for MOSART are given below.

Descriptions of all input variables, together with declarations of PARAMETERS, INTRINSIC and EXTERNAL routines, local variables, and COMMON blocks are provided.
REAL FUNCTION ABCCL4

Argument Declarations:

V    - REAL Variable - Wavenumber (cm⁻¹)
TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
INTRINSIC INT
EXTERNAL XTERP,CROSBD

Local Variable Declarations:

INTEGER I,N
REAL TMP(5)

COMMON Blocks: /CRSECT/


REAL FUNCTION ABHNO4

Argument Declarations:

V    - REAL Variable - Wavenumber (cm⁻¹)
TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
INTRINSIC INT
EXTERNAL XTERP,CROSBD

Local Variable Declarations:

INTEGER I,N
REAL TMP(5)

COMMON Blocks: /CRSECT/


REAL FUNCTION ABN205

Argument Declarations:

V    - REAL Variable - Wavenumber (cm⁻¹)
TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
INTRINSIC INT
EXTERNAL XTERP,CROSBD

Local Variable Declarations:

INTEGER I,N
REAL TMP(5)

COMMON Blocks: /CRSECT/
REAL FUNCTION ABSCFC

Argument Declarations:

V       - REAL Variable - Wavenumber (cm⁻¹)
TEMP    - REAL Variable - Temperature (K)
INDCFC  - INTEGER Variable - CFC index
          INDRCFC = 1 implies CC13F (CFC-11)
          INDRCFC = 1 implies CC12F2 (CFC-12)
          INDRCFC = 1 implies CF4 (CFC-13)
          INDRCFC = 1 implies C1F3 (CFC-14)
          INDRCFC = 1 implies CHF2Cl (CFC-22)
          INDRCFC = 1 implies C2Cl3F3 (CFC-113)
          INDRCFC = 1 implies C2Cl2F4 (CFC-114)
          INDRCFC = 1 implies C2ClF5 (CFC-115)

INTRINSIC and EXTERNAL Declarations:

REAL       XTERP
INTRINSIC  INT
EXTERNAL    XTERP,CFCBD

Local Variable Declarations:

INTEGER    I,N
REAL       TMPFCFC(5)

COMMON Blocks: /CFCBM/

REAL FUNCTION ABSCLO

Argument Declarations:

V       - REAL Variable - Wavenumber (cm⁻¹)
TEMP    - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL       XTERP
INTRINSIC  INT
EXTERNAL    XTERP,CROSBD

Local Variable Declarations:

INTEGER    I,N
REAL       TMP(5)

COMMON Blocks: /CRSect/
REAL FUNCTION ABSH2O

Argument Declarations:

\[ V \quad \text{REAL Variable - Wavenumber (cm}^{-1}) \]

INTRINSIC and EXTERNAL Declarations:

INTRINSIC

REAL, INT, MIN

Local Variable Declarations:

INTEGER I, IP, NPTS
REAL CH2O(4), WL, WLX, FAC, WL1, WL2, DWL

COMMON Blocks: None

SUBROUTINE ABSMOL

Argument Declarations:

\[ V \quad \text{REAL Variable (Input) - Wavenumber (cm}^{-1}) \]
\[ SDV \quad \text{REAL Vector (Len = Unspecified) (Output) - Extinction coefficient (cm}^{-1}) \]
\[ ODV \quad \text{REAL Vector (Len = Unspecified) (Output) - Inverse line spacing (cm)} \]
\[ CDV \quad \text{REAL Vector (Len = Unspecified) (Output) - Pressure-broadened continuum extinction coefficient (cm}^{-1}) \]
\[ TDEPA \quad \text{REAL Variable (Output) - Temperature-dependence exponent for line width} \]
\[ ALF \quad \text{REAL Variable (Output) - Foreign-broadened line width at STP (cm}^{-1}) \]
\[ RADFL0 \quad \text{REAL Vector (Len = Unspecified) (Input) - Radiation field term for the band temperatures} \]
\[ PRTN0 \quad \text{REAL Vector (Len = Unspecified) (Input) - Partition function for the band temperatures} \]
\[ NTEMP \quad \text{INTEGER Variable (Output) - Number of temperature values} \]
\[ MOLEC \quad \text{INTEGER Variable (Input) - Molecular index number} \]

PARAMETER Declarations:

\[ \text{INTEGER NPMAX, NTMPMX, MOLMAX, MLIDMX} \]
\[ \text{(MPMAX=250, NTMPMX=5, MOLMAX=26, MLIDMX=45)} \]

INTRINSIC and EXTERNAL Declarations:

\[ \text{CHARACTER*72 IOERR} \]
\[ \text{INT, ABS, REAL} \]
\[ \text{DEVCBD, UFTPBD, IOERR} \]

Local Variable Declarations:

\[ \text{INTEGER I, N, NREC, IOS, IBIN(NPMAX), IMOL(NPMAX), IP, IV, IALF(NPMAX), NRECU} \]
\[ \text{REAL VDUM(MOLMAX), SDZ(NTMPMX, NPMAX), ODZ(NTMPMX, NPMAX)} \]

COMMON Blocks: /CONSTM/, /DEVICE/, /MOLEC/, /UFTAPE/
REAL FUNCTION ABSN2

Argument Declarations:

- \( V \) - REAL Variable - Wavenumber (cm\(^{-1}\))
- \( TEMP \) - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

- INTRINSIC REAL, INT, MIN, SQRT

Local Variable Declarations:

- INTEGER I, IP, NPTS
- REAL CN2(133), T0, TSS, VX, FAC, V1, V2, DV

COMMON Blocks: None

REAL FUNCTION ABSN20

Argument Declarations:

- \( V \) - REAL Variable - Wavenumber (cm\(^{-1}\))

INTRINSIC and EXTERNAL Declarations:

- INTRINSIC REAL, INT, MIN

Local Variable Declarations:

- INTEGER I, IP, NPTS
- REAL CN20(7), WL, WLX, FAC, WL1, WL2, DWL

COMMON Blocks: None

REAL FUNCTION ABSNO2

Argument Declarations:

- \( V \) - REAL Variable - Wavenumber (cm\(^{-1}\))

PARAMETER Declarations:

- INTEGER NMAX
- PARAMETER (NMAX=7176)

INTRINSIC and EXTERNAL Declarations:

- INTRINSIC INT, REAL
- EXTERNAL NO2BD

Local Variable Declarations:

- INTEGER N
- REAL XI, FAC

COMMON Blocks: /NO2XS/
SUBROUTINE ABSO2

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm⁻¹)
PRESS - REAL Variable (Input) - Pressure (mb)
TEMP - REAL Variable (Input) - Temperature (K)
SIGMA - REAL Variable (Output) - Absorption coefficient (cm⁻¹ atm)
CONT - REAL Variable (Output) - Continuum absorption coefficient (cm⁻¹ atm)
IBAND - INTEGER Variable (Input/Output) - Band model index
QA - REAL Variable (Input/Output) - LOWTRAN double exponential band model parameter

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
INTRINSIC INT,MN,REAL
EXTERNAL XTERP,O2UVBD

Local Variable Declarations:

INTEGER I,IP,ITRP1
REAL P0,T0,DENUM,WL,TORRAT,SDV,APR,VX,FAC,PS,TS

COMMON Blocks:
/HERZBG/, /SHURUN/

REAL FUNCTION ABSO3

Argument Declarations:

V - REAL Variable - Wavenumber (cm⁻¹)
TEMP - REAL Variable - Temperature (K)

PARAMETER Declarations:

INTEGER NMAX (NMAX=3080)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MIN,REAL,INT
EXTERNAL O3HHBD,O3CWBD

Local Variable Declarations:

INTEGER I,IP
REAL DT,VX,FAC,C0,C1,C2

COMMON Blocks:
/O3CWBD/, /O3HHB/

110
REAL FUNCTION ABSSO2

Argument Declarations:

V - REAL Variable - Wavenumber (cm⁻¹)

PARAMETER Declarations:

INTEGER NMAX
PARAMETER (NMAX=5562)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC INT, REAL
EXTERNAL SO2BD

Local Variable Declarations:

INTEGER N
REAL XI, FAC

COMMON Blocks: /SO2XS/

SUBROUTINE AECALC

Argument Declarations:

HXTRA - REAL Vector (Len = Unspecified) (Input) - Extra altitudes in altitude grid
NXTRA - INTEGER Variable (Input) - Dimension of HXTRA
TITLE - CHARACTER(*) Variable (Input) - Title in printout
HEADNG - CHARACTER(*) Variable (Input) - Heading in printout

INTRINSIC and EXTERNAL Declarations:

REAL PLANCK
INTRINSIC REAL, MAX, MIN
EXTERNAL PLANCK

Local Variable Declarations:

INTEGER I, IM, IP
REAL ASUM, ESUM, TSOLAR, TTHRML, V, DV, A, E

COMMON Blocks: None
SUBROUTINE AEROSOL

Argument Declarations:

IAERO - INTEGER Variable (Input) - Index for aerosol type
RH - REAL Variable (Input) - Relative humidity
LAYER - INTEGER Variable (Input) - Layer index
VIS - REAL Variable (Output) - Visible range (km)
This is output for the Navy Marine aerosol model, IAERO = 4, and the Desert aerosol model, IAERO = 6.
WIND - REAL Variable (Input) - Current windspeed (m/sec)
WHH - REAL Variable (Input) - 24-hour average windspeed (m/sec)
ICSTL - INTEGER Variable (Input) - Coastal influence index
TEMP - REAL Variable (Input) - Temperature (K)

PARAMETER Declarations:

INTEGER MMLAX, NWLAER, NWLCLD, NANG, NSTTMP
PARAMETER (MMLAX=140, NSTTMP=16)
PARAMETER (NWLAER=47, NWLCLD=79, NANG=65)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
INTRINSIC MAX, MIN
EXTERNAL PROFAC, MARINE, ARSLBD, DESEAER, BKSTBD, XTERP,
MIEPHS, ARSABD, ARSXBD

Local Variable Declarations:

INTEGER I, IAP, ITRP1, IKATRL
REAL BEXT(NWLAER), RNX, CXV, SUM

COMMON Blocks: /AEROSL/, /AERSCA/, /AERSLA/, /AERSLX/, /AERUSR/,
 /BSTAER/

REAL FUNCTION AH2O2

Argument Declarations:

V - REAL Variable - Wavenumber (cm⁻¹)

PARAMETER Declarations:

INTEGER NWL
PARAMETER (NWL=29)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
EXTERNAL XTERP

Local Variable Declarations:

INTEGER ITRP
REAL XH2O2(NWL), XD2O2(NWL), WL(NWL), WL0, XLOSCH,
PH2O2

COMMON Blocks: None
REAL FUNCTION AIRTMP

Argument Declarations:

HOUR - REAL Variable - Hour of the day (decimal time)
MONTH - INTEGER Variable - Month of the year (JAN = 1)
TMIDN - REAL Variable - Air temperature at midnight (K)
TNOON - REAL Variable - Air temperature at noon (K)
HOUR0 - REAL Variable - Reference hour (decimal time)
TAIR0 - REAL Variable - Reference air temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SIN, COS

Local Variable Declarations:

REAL B(12), THETA, DELT

COMMON Blocks: /CONSTN/

SUBROUTINE AMMNIA

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm⁻¹)
SD - REAL Variable (Output) - S/d (amagat⁻¹ cm⁻¹)
      Note: SD still needs to be multiplied by the rotation and vibration partition function
OD - REAL Variable (Output) - 1/d (cm)
CD - REAL Variable (Output) - Line wings contribution (amagat⁻¹ cm⁻¹)
      Note: CD still needs to be multiplied by the rotation and vibration partition function
ALF - REAL Variable (Output) - Line width (cm⁻¹)
IBAND - INTEGER Variable (Output) - Band model index

INTRINSIC and EXTERNAL Declarations:

INTRINSIC INT, MIN

PARAMETER Declarations:

INTEGER NVMAX
PARAMETER (NVMAX=111)

Local Variable Declarations:

INTEGER IV
REAL SDV(NVMAX), ODV(NVMAX), ALFV, FAC, V1, V2, DV

COMMON Blocks: None

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REAL FUNCTION AMOLSC

Argument Declarations:

V - REAL Variable - Wavenumber (cm⁻¹)
P - REAL Variable - Pressure (mb)
T - REAL Variable - Temperature (K)
WH2O - REAL Variable - Water vapor mixing ratio (ppm)
WCO2 - REAL Variable - Carbon dioxide mixing ratio (ppm)
WO2 - REAL Variable - Oxygen mixing ratio (ppm)

INTRINSIC and EXTERNAL Declarations:

REAL DEPOL
DOUBLE PRECISION REFRAC
INTRINSIC REAL,DPROD
EXTERNAL REFRAC

Local Variable Declarations:

REAL WL
DOUBLE PRECISION DUM,DPL,XN,AN0

COMMON Blocks: */CONSTN/*

SUBROUTINE ASPECT

Argument Declarations:

ISHINE - INTEGER Variable (Input) - Sky/Earthshine index
  Refer to User Reference Manual for definition.
PHISH - REAL Vector (Len = Unspecified) (Output) - Sky/Earthshine
  angles (deg)
NASPCT - INTEGER Variable (Output) - Number of Sky/Earthshine angles
LSRCE - INTEGER Variable (Input) - Location of source altitude in
  altitude array
LBKGD - INTEGER Variable (Input) - Location of background altitude in
  altitude array
XMH - REAL Vector (Len = Unspecified) (Input) - Atmospheric
  refractivity as a function of altitude
RE - DOUBLE PRECISION Variable (Input) - Earth radius (km)
HT - REAL Variable (Input) - Source altitude (km)

PARAMETER Declarations:

INTEGER MLMAX,NASMAX,ISMX,MOLMAX
PARAMETER (MLMAX=140, NASMAX=15)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, DBLE, ACOS, ABS
EXTERNAL GETGLC

Local Variable Declarations:

INTEGER K,M,ICHK,KASPCT(15)
REAL DPHI, PHI0, PHIHor, PHIX, A, B
DOUBLE PRECISION HORA, XMU(5), W(5)

COMMON Blocks: */CONSTN,*/USERDF/*
SUBROUTINE ATMMPRN

Argument Declarations:

IFLTR - INTEGER Variable (Input) - Index for filter response
 IFLTR = 0 implies a square wave response
 IFLTR = 1 implies a user-defined response

TFLTR - CHARACTER*(*) Variable (Input) - Title for user-defined filter

HEADNG - CHARACTER*(*) Variable (Input) - User-defined heading

TITLE - CHARACTER*(*) Variable (Input) - Title

BW  - REAL Variable (Input) - Bandwidth (cm⁻¹)

BWL  - REAL Variable (Input) - Bandwidth (µm)

IGEOM - INTEGER Variable (Input) - Geometry number

IV  - INTEGER Variable (Input) - Spectral interval number

ISMARY - INTEGER Variable (Input) - Summary switch

PARAMETER Declarations:

INTEGER   NGMAX, NAZMAX, NASMAX, NZSMAX, NMATL, NSCEN, MAXLAT,
          MAXLON, NL, ISMX, NVSMAX, MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (NMATL=28, NSCEN=35, NVSMAX=20)
PARAMETER (MAXLAT=3, MAXLON=1, NL=50)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

REAL      RELHUM
CHARACTER*72 IOERR
INTRINSIC   REAL, DBLE, SQRT, COS, SIN
EXTERNAL   DEVCB, RELHUM, CHRCBD, PRLAT, SETBCK,
            INDXBK, IOERR, ATMSBD, BKGDBD, SCENBD

Local Variable Declarations:

INTEGER   I, K, M, MM, IOS, JT, IERR, ITYPE0, ITYPE1, KSCNE
REAL       WLI, WL2, RHW(NAZMAX), RHI(NAZMAX), ALTPR(NAZMAX),
           TAIRP, FRSNWP, CLDCVP(0:3), TERR, TMIDNP, TMONP,
           PRICEP, FRTWRF
DOUBLE PRECISION RE
CHARACTER*24 TFLTR0, TFLTRX
LOGICAL PLBK

COMMON Blocks: /ATMDAT/, /BACKGD/, /CHRCNM/, /CONSTN/, /DEVICE/,
                /FLAGS/, /HEADER/, /INTSTO/, /OUTPUT/, /SCENES/
DOUBLE PRECISION FUNCTION BAND

Argument Declarations:

XSTAR - DOUBLE PRECISION Variable - Weak line optical depth
S1 - REAL Variable - Summing variable for Lorentz halfwidth
times line density
S2 - REAL Variable - Summing variable for Doppler halfwidth
times line density
S3 - REAL Variable - Summing variable for line density
S6 - REAL Variable - Summing variable for (Lorentz halfwidth)^2
times line density
QA - REAL Variable - Exponential parameter for LOWTRAN model
DV - REAL Variable - Wavenumber increment (cm^-1)
IBAND - INTEGER Variable - Index for band model
IBAND = 0 for exponential band model
IBAND = 1 for Voight band model
IBAND = 2 for LOWTRAN double exponential model

PARAMETER Declarations:

INTEGER MOLMAX, MLIDMX
PARAMETER (MOLMAX=26, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

DOUBLE PRECISION DERF
INTRINSIC MAX, MIN, REAL, SQRT, LOG, ABS, DBLE, EXP, LOG10
EXTERNAL DERF

Local Variable Declarations:

INTEGER IEXP
REAL ANLINE, EXMIN
DOUBLE PRECISION ACBAR, ADBAR, ODBAR, XS, TXP, WS, QAWS, WL, WD, DUM, U23
AC2BAR, RHO, F1, F2, F3, XSTARP, WSL, U0, U2, RATIO
DOUBLE PRECISION STORE, WL, WD, U0

COMMON Blocks: /CONSTN/, /MOLECPL/
SUBROUTINE BBARSL

Argument Declarations:

ARSLAS - REAL Vector (Len = Unspecified) (Output) - Aerosol absorption for the solar region (km$^{-1}$)
ARSLSS - REAL Vector (Len = Unspecified) (Output) - Aerosol scattering for the solar region (km$^{-1}$)
ARSLAT - REAL Vector (Len = Unspecified) (Output) - Aerosol absorption for the thermal region (km$^{-1}$)
ARSLST - REAL Vector (Len = Unspecified) (Output) - Aerosol scattering for the thermal region (km$^{-1}$)
ZP - REAL Vector (Len = Unspecified) (Output) - Altitude array for multiple scattering calculation (m)
KK - INTEGER Variable (Input) - Latitude index
LL - INTEGER Variable (Input) - Longitude index

PARAMETER Declarations:

INTEGER MLMAX, NWLAER, NWLCLD, NANG, NGMAX, MAXLAT, MAXLON, ISMX, MOLMAX, MLIDMX
PARAMETER (MLMAX=140, NGMAX=15, MAXLAT=3, MAXLON=1)
PARAMETER (NWLAER=47, NWLCLD=79, NANG=65)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

REAL PLANCK, XTERP
EXTERNAL PLANCK, XTERP, ARSLBD

Local Variable Declarations:

INTEGER I, L, LZ, TMPSLR, TMPTML, SUMS, SUMT, V, DV, PLTML, PLSLR, A, S, WZ, DUMA(101), DUMAP(101), DUNS(101), DUMSP(101), DUMW(101), ZKM

COMMON Blocks: /AEROSL/, /AERSCA/, /INITAL/, /MOLECP/

REAL FUNCTION BB03

Argument Declarations:

X - REAL Variable - Ozone concentration (atm-cm STP)
SUBROUTINE BCKCHK

Argument Declarations:

ITERM - INTEGER Variable (Input/Output) - Background index.
          Refer to User Reference manual for definition.
SCTNGS - REAL Variable (Input) - Solar scattering angle (deg)
          SCTNGS = 0.0 implies looking directly into the sun
SCTNGL - REAL Variable (Input) - Lunar scattering angle (deg)
          SCTNGL = 0.0 implies looking directly into the moon

PARAMETER Declarations:

   INTEGER  NGMAX
   PARAMETER (NGMAX=15)

COMMON Blocks: /FLAGS/
SUBROUTINE BCKGND

Argument Declarations:

- ITYPE - INTEGER Variable (Input) - Type of background
- V - REAL Variable (Input) - Wavenumber (cm⁻¹)
- DV - REAL Variable (Input) - Wavenumber increment (cm⁻¹)
- RADEM - REAL Variable (Output) - Emitted background radiance (W/cm²/sr/cm⁻¹)
- RADERF - REAL Variable (Output) - Reflected background radiance (W/cm²/sr/cm⁻¹)
- RADSD - REAL Variable (Output) - Standard deviation of the background radiance (W/cm²/sr/cm⁻¹)
- XLGAL - REAL Variable (Input) - Galactic azimuth (deg)
- BGAL - REAL Variable (Input) - Galactic elevation (deg)
- XLECL - REAL Variable (Input) - Ecliptic azimuth (deg)
- BECL - REAL Variable (Input) - Ecliptic elevation (deg)
- HSKYSH - REAL Variable (Input) - Spectral, spatially integrated emitted skyshine (W/cm²/cm⁻¹)
- HSCATT - REAL Variable (Input) - Spectral, spatially integrated scattered solar skyshine (W/cm²/cm⁻¹)
- HSOLAR - REAL Variable (Input) - Spectral solar irradiance (W/cm²/cm⁻¹)
- PROJS - REAL Vector (Len = Unspecified) (Input) - Projection of solar irradiance on oriented surfaces
- SHDMS - REAL Variable (Input) - Solar self-shadowing factor
- HLUNAR - REAL Variable (Input) - Spectral lunar irradiance (W/cm²/cm⁻¹)
- PROJL - REAL Vector (Len = Unspecified) (Input) - Projection of lunar irradiance on oriented surfaces
- SHDWL - REAL Variable (Input) - Lunar self-shadowing factor
- TAU - REAL Variable (Input) - Transmittance observer-background
- PHIIS - REAL Variable (Input) - Elevation angle of incident solar radiation (deg)
- PHIIIL - REAL Variable (Input) - Elevation angle of incident lunar radiation (deg)
- PHIRF - REAL Variable (Input) - Elevation angle of reflected line of sight at the background (deg)
- AZOBS - REAL Variable (Input) - Observer azimuthal angle (deg)
- AZSOL - REAL Variable (Input) - Azimuthal angle between incident solar and reflected lines-of-sight (deg)
- AZLUN - REAL Variable (Input) - Azimuthal angle between incident lunar and reflected lines-of-sight (deg)
- BCKSUM - REAL Array (Dim = 6 x Unspecified) (Input/Output) - Background material radiances (W/cm²/sr/cm⁻¹)
- CC - REAL Variable (Input) - Fractional cloud cover
- BCKFAC - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Background temperature proportionality factor
- NPTH - INTEGER Array (Dim = 2 x Unspecified) (Input) - Limits for non-zero elements of BCKFAC
- FRSNW - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Percentage snow (%)
- PRICE - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Percentage ice (%)
- FRWTR - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Percentage water (%)

PARAMETER Declarations:

- INTEGER NMAX, NAZMAX, NASMAX, NZSMAX, NMLAT, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX
- PARAMETER (NMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
- PARAMETER (NMLAT=28, NVSMAX=20)
- PARAMETER (MAXLAT=3, MAXLON=1, MOLMAX=26, ISMX=MOLMAX+8)
INTRINSIC and EXTERNAL Declarations:

REAL
- XTERP, SOLAR, GALRAD, PLANCK, STARAD, ZODICL, EXGALS.
- SLUNAR, BDRF

COMPLEX
- INDEXW, INDEXI, EMTREF, REFEST

INTRINSIC
- SQRT, REAL, DBLE, DPROD, ABS, SIN, COS

EXTERNAL
- XTERP, SOLAR, GALRAD, PLANCK, STARAD, ZODICL, EXGALS.
- BKGDDB, SLUNAR, FRESNL, BDRF, INDEXW, INDEXI,
- EMTREF, SETBCK, REFEST, DEMSXX

Local Variable Declarations:

INTEGER
- I, K, M, NDX, KK, LL, IGRND, ITRP0, NINCL, IRGH0, IRGH1

REAL
- OMEG, WL0, REFLS, REFLL, REFLD, EMIS, PK, XNORM (6, 3),
- REFLX, TMPNDX (6), EMV, EMH, EMV1, EMH1, EMVF, EMHF,
- SLOPE, FOAMT, WVHT, TMPLYR (0:3), TAIYRD, UOBS (3),
- USOL (3), ULUN (3), POBS, PSOL, PLUN, XOBS, XSOX, XLUN

DOUBLE PRECISION
- EM, EMI, RF, RFI, RTER (6), RTER (6), RTERD, VARNC,
- DUMP, SDVM, DUMR, FRSLP (6)

COMPLEX
- DIELBC, XMUC, INAIR (2), INICE, INMAT, REFR, EPSX, RH,
- RV, TV, TH, EPSA

COMMON Blocks:
- /BACKGD/, /CONSNT/, /HEADER/
SUBROUTINE BCKPRN

Argument Declarations:

IFLTR - INTEGER Variable (Input) - Index for filter response
        IFLTR = 0 implies a square wave response
        IFLTR = 1 implies a user-defined response
TFLTR - CHARACTER(*) Variable (Input) - Title for user-defined filter
HEADBK - CHARACTER(*) Variable (Input) - User-defined heading
TITLE - CHARACTER(*) Variable (Input) - Title
BW - REAL Variable (Input) - Bandwidth (cm⁻¹)
BWL - REAL Variable (Input) - Bandwidth (µm)
IGEOM - INTEGER Variable (Input) - Geometry number
IV - INTEGER Variable (Input) - Spectral set number
FLBCKZ - LOGICAL Variable (Input) - Flag for existence of background parameters

PARAMETER Declarations:

INTEGER NGMAX, NAZMAX, NASMAX, MLMAX, NZSMAX, MAXLAT,
       MAXLON, NL, ISMX, NVMAX, MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MLMAX=140, NL=50, NVMAX=20)
PARAMETER (MAXLAT=3, MAXLON=1, MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
INTRINSIC REAL, DBLE, SQRT, COS, SIN
EXTERNAL DEVCOB, IOERR, ATMSBD

Local Variable Declarations:

INTEGER MM, LB, IOS
REAL WL1, WL2
DOUBLE PRECISION RE
CHARACTER*24 TFLTR0, TFLTRX

COMMON Blocks:

/ATMDAT/, /BCKDAT/, /CONSTN/, /DEVICE/, /FLAGS/,
/HEADER/, /OUTPUT/
REAL FUNCTION BDRF

Argument Declarations:

PHII - REAL Variable - Incident elevation angle (deg)
PHIR - REAL Variable - Reflected elevation angle (deg)
AZIM - REAL Variable - Azimuth (deg)
WL - REAL Variable - Wavelength (μm)
DELH - REAL Variable - Standard deviation of surface roughness (m)
CORREL - REAL Variable - Correlation length of surface roughness (m)
ITYPE - INTEGER Variable - Roughness type
      ITYPE = 1 implies Gaussian roughness
      Otherwise, exponential roughness
DIELBC - COMPLEX Variable - Permittivity (dielectric constant and
      conductivity) of surface
XMUC - COMPLEX Variable - Permeability of surface

INTRINSIC and EXTERNAL Declarations:

REAL
COMPLEX
INTRINSIC
EXTERNAL

Local Variable Declarations:

INTEGER
REAL
DOUBLE PRECISION
COMPLEX

COMMON Blocks: /CONSTN/
SUBROUTINE BEAUTF

Argument Declarations:

- WIND  - REAL Variable (Input) - Wind speed at 10 m (m/sec)
  Note: 10 m height per Resolution 9, International Meteorological Committee, Paris, 1946
- WAVEHT  - REAL Variable (Output) - Wave height (m)
- SLOPE  - REAL Variable (Output) - RMS wave slope
- FOAM  - REAL Variable (Output) - Fraction of foam

INTRINSIC and EXTERNAL Declarations:

INTRINSIC AINT, MAX, MIN, SQRT

Local Variable Declarations:

- INTEGER I, IBFRT
- REAL WINDMNI(0:17), WNDMIN(0:17), HTMIN(0:17), HTMAX(0:17), WNDSPD, FAC,
  WINDCM(3,2), SLOPCM(3,2)

COMMON Blocks: None

REAL FUNCTION BETA

Argument Declarations:

- ASYM  - REAL Variable - Phase function asymmetry factor

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, ABS, SQRT, MAX, MIN, DBLE

Local Variable Declarations:

- INTEGER I, J
- REAL GJ, A(1000), SUM, DSUM, G, A0, G2, XBETA
- REAL ARG(60)

COMMON Blocks: /CONSTN/
REAL FUNCTION BETAU

Argument Declarations:

XMU0  - REAL Variable - Cosine of the zenith angle
ASYM  - REAL Variable - Phase function asymmetry factor

INTRINSIC and EXTERNAL Declarations:

INTRINSIC       ABS, REAL, MAX, MIN, SQRT

Local Variable Declarations:

INTEGER         I, J, JP
REAL            PJM, PJ, G2, AU(3, 1000), GJ(3), SUM, DSUM, A0, G

COMMON Blocks:  /CONSTN/

SUBROUTINE BINFIL

Argument Declarations:

IFINP  - INTEGER Variable (Input/Output) - Input file number
IFATM  - INTEGER Variable (Input/Output) - Atmosphere/source file number
IFBCK  - INTEGER Variable (Input/Output) - Background file number
IPPLM  - INTEGER Variable (Input/Output) - Plume file number
IFMSC  - INTEGER Variable (Input/Output) - Multiple scatter file number
IFTRN  - INTEGER Variable (Input/Output) - Component transmission file number
IHTRR  - INTEGER Variable (Input/Output) - Heat transfer file number
IFTP7  - INTEGER Variable (Input/Output) - MODTRAN TAPE7 file number
IFTP8  - INTEGER Variable (Input/Output) - MODTRAN TAPE8 file number
IFDIS  - INTEGER Variable (Input/Output) - DIS data base file number
FILENM - CHARACTER*(*) Vector (Len = Unspecified) - File names
ISMARY - INTEGER Variable (Output) - File summary switch

PARAMETER Declarations:

INTEGER         NGMAX
PARAMETER       (NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*1    UPCASE
CHARACTER*72    IOERR
EXTERNAL        RDLINE, FLSTAT, UPCASE, CHKRT, IOERR, CHKVER, DISEND

Local Variable Declarations:

INTEGER         IOS, NDP1, NDP2, NDP3, IUMP
LOGICAL         FILXST, FILXS, FILXSP, FILXSM, FILXSC, FILXS, FILXS7, FILXS8, LDUM

CHARACTER*1    YES
CHARACTER*3    STAT(2)
CHARACTER*40   HEADNG, HEADNB
CHARACTER*80   TITLE, TITLB
CHARACTER*255  VARIAB

COMMON Blocks:  /FLAGS/, /RESTART/
SUBROUTINE BMOD

Argument Declarations:

*  V      - REAL Variable (Input) - Wavenumber (cm⁻¹)
*  DV     - REAL Variable (Input) - Wavenumber increment (cm⁻¹)
*  NLAT   - INTEGER Variable (Input) - Number of latitudes
*  NLLON  - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

PARAMETER INTEGER MMAX, ISMX, MAXTMP, MAXLAT, MAXLON, NGMAX, MOLMAX, MLIDMX
PARAMETER (MMAX=140, MOLMAX=26, ISMX=MOLMAX+8, MAXTMP=5)
PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

REAL RADFLD, PARTIT, ABSN2, ABSH20, ABSN20, ABSNO2, ABSSO2, ABSO3, O2CNT, AH202, ABCFCC, ABCCLA, ABHNO4, ABHNO4, ABSCLO

LOGICAL EVEN

INTRINSIC SQRT, ABS, REAL, INT, MIN

EXTERNAL PROFAC, MOLPBD, EVEN, RADFLD, ABSMOL, PARTIT, ABSNO2, ABSN2, ABSO3, O2CNT, ABSO2, ABSH20, ABSN20, ABSSO2, AH202, AMXNIA, ABCFCC, ABCCLA, ABHNO4, ABHNO4, ABSCLO

Local Variable Declarations:

INTEGER K, L, N, KEYML (MMAX, MAXLAT, MAXLON), KK, LL, NDV, KEYMLP (MMAX, MAXLAT, MAXLON), ISWX, MOLOD, NTEMP, IV, KEY, KEYP

REAL SD2 (ISMX, MMAX, MAXLAT, MAXLON), SDV (MAXTMP), ODV (MAXTMP), T0, V0, SUM, VP, WT, CDV (MAXTMP), TEBAND (MAXTMP), RADFL (MMAX, MAXLAT, MAXLON), ADO (ISMX), FAC (MMAX, MAXLAT, MAXLON), ALF, TS (MMAX, MAXLAT, MAXLON), TDEFA, PRNT0 (MAXTMP, ISMX), TSS (MMAX, MAXLAT, MAXLON), RADFL0 (ISMX), ODAV (ISMX, MMAX, MAXLAT, MAXLON), SDX, ODX, CDSX, CDX, PS, P0, HERZ, CDX25, CDSX25

LOGICAL EVEN

COMMON Blocks: /CONSTN/, /INITIAL/, /MOLCON/, /MOLDAT/, /MOLEC/, /PRTBND/, /PRTNB/
SUBROUTINE BNDMLG

Argument Declarations:

MOLEC - INTEGER Variable (Input) - Molecular index
   1 - Water vapor
   2 - Carbon dioxide
   3 - Ozone
   4 - Nitrogen oxide
   5 - Carbon monoxide
   6 - Methane

TEMP - REAL Variable (Input) - Temperature (K)

F - REAL Vector (Len = Unspecified) (Output) - Line strength partition function

G - REAL Variable (Output) - Fine structure partition function

NINN - INTEGER Variable (Input) - DIMENSION of F

PARAMETER Declarations:

   INTEGER         MOLMAX
   PARAMETER       (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

   INTRINSIC       SQRT, EXP

Local Variable Declarations:

   INTEGER         K
   REAL            TH(MOLMAX), ETHTL, ETHKTL, FN, SUM, SUM1

COMMON Blocks: None
SUBROUTINE BNDPAR

Argument Declarations:

* V - REAL Variable (Input) - Wavenumber (cm⁻¹)
DV - REAL Variable (Input) - Wavenumber increment (cm⁻¹)

PARAMETER Declarations:

* INTEGER MLMAX, ISMX, NAZMAX, NASMAX, NGMAX, NZSMAX, NWLAER,
  NWLCLD, NANG, MAXLAT, MAXLON, NVSMAX, MOLMAX,
  MLIDMX
PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (NWLAER=47, NWLCLD=79, NANG=65)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

INTEGER IBNSRC
REAL AMOLSC, XTERP, PHMLSC
EXTERNAL AMOLSC, XTERP, PHFUNC, ARSLBD, BMOD, RAINSP, SNOWSP,
          IBNSRC, OPNSCR, MOLPBD, PHMLSC
CMMW EXTERNAL MMWPAR

Local Variable Declarations:

INTEGER I, L, K, JICE, JCIRUS, KK, LL, ITRP
REAL P0, T0, WL, RNABS, RNSCT, SNABS, SNSCT, PS, TS, SDT, DUM,
     CDT, SCPHM, SCPHX, PPIINV, PHASEM(NANG)

COMMON Blocks:

/AEROSL/, /AERSCA/, /AERSCC/, /ARSLSC/, /CGWTS/,
/CLOUDR/, /CONSTN/, /HEADER/, /INITAL/, /LOWMSC/,
/MOLCON/, /MOLECP/, /PRBND/, /PRENDB/
SUBROUTINE EINTPCH

Argument Declarations:

XS - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Optical depth
S1 - REAL Vector (Len = Unspecified) (Input) - Summing variable for Lorentz halfwidth times line density.
S2 - REAL Vector (Len = Unspecified) (Input) - Summing variable for Doppler halfwidth times line density.
S3 - REAL Vector (Len = Unspecified) (Input) - Summing variable for line density
S4 - REAL Vector (Len = Unspecified) (Input) - Summing variable for continuum
S5 - REAL Vector (Len = Unspecified) (Input) - Summing variable for scattering
S6 - REAL Vector (Len = Unspecified) (Input) - Summing variable for (Lorentz halfwidth)^2 times line density.
XSS - DOUBLE PRECISION Vector (Len = Unspecified) (Output) - Initial values of optical depth for new path
S1S - REAL Vector (Len = Unspecified) (Output) - Initial values of S1 for new path
S2S - REAL Vector (Len = Unspecified) (Output) - Initial values of S2 for new path
S3S - REAL Vector (Len = Unspecified) (Output) - Initial values of S3 for new path
S4S - REAL Vector (Len = Unspecified) (Output) - Initial values of S4 for new path
S5S - REAL Vector (Len = Unspecified) (Output) - Initial values of S5 for new path
S6S - REAL Vector (Len = Unspecified) (Output) - Initial values of S6 for new path
N - INTEGER Variable (Input) - Number of species

Local Variable Declarations:

INTEGER K

COMMON Blocks: None
SUBROUTINE BRNDR

Argument Declarations:

TMIDN - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Temperature at
        midnight (K)
TNOON - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Temperature at
        noon (K)
INITV - INTEGER Variable (Input) - Restart spectral index
HEADNG - CHARACTER(*) Variable (Input) - Header
TITLE - CHARACTER(*) Variable (Input) - Title
MTIME - INTEGER Variable (Output) - Number of temporal values

PARAMETER Declarations:

INTEGER NGMAX, NAZMAX, NASMAX, NZSMAX, NMATL, NL, NSCEN,
       NTIME, MLMAX, ISMX, NANTMX, NAYER, MAXLAT, MAXLON,
       NVSMAX, MOLMAX, MILDMX
PARAMETER (NMATL=28, NSCEN=35)
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (NTIME=97, MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (NANTMX=25, NAYER=20)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (NL=50, MILDMX=45)

INTRANISIC and EXTERNAL Declarations:

REAL SLRCNT, XTERP, AIRTMP, SATUR, SEATMP
CHARACTER*72 IOERR

INTRANISIC SIN, MAX, MTN, REAL, ABS, COS, SQRT, MOD
EXTERNAL SLRCNT, PRETEM, OPATH, FLUXLM, SOLBND, IOERR, BBARSL,
           AIRTMP, EPHEMS, HTBLCN, XTERP, DEVCBD, CHRCBD,
           SATUR, BKGDBD, SPLYR, SEATMP, ATMSBD, MOLPBD

Local Variable Declarations:

INTEGER I, K, L, M, IM, MTL, ITM, NSTAB, IOS, KK, LL, IG, NDAYS,
       JTIME, ITRP0, ITRP6, ITYPE, MTLF, LL0
REAL ZP(101), UP(101), VP(101), WP(101), ALBS, EMRAD,
     DELTIM, RPDS(NTIME, 6, NMATL),
     DCTIME, SOLDIX, YLUNA2, YLUNEV, UO,
     YLUNDS, PHLUNY, LTEMP(NTIME), TSRF(NTIME),
     PO, SIGMA, CC, T4, T1, T2, TAIRLC(NTIME), STABRS,
     XLATS, XLONS, XLATL, XOLON, DT24, DUM,
     WINDT(NTIME), PAIRLC(NTIME), CHZOLC(NTIME),
     CLCVT(3, NTIME), CLEST(3, NTIME), CLTFT(3, NTIME),
     AHRN(NANTMX), RHT, SRLCX, TLAGER(0:NLAYER+1),
     DTMX, SPHLRY(0:NLAYER+1), DNLRY(0:NLAYER+1),
     HTRLY(0:NLAYER+1), ZLAGER(0:NLAYER+1), TSSL,
     DUMLYR(2, NLAYER+1), ARSLAS(101), ARSLSS(101),
     ARSLAT(101), ARSLST(101), XNORM(6, 3), SATURL,
     SOLTLM, SOLAIZ, SOLEVL

LOGICAL FLINI

COMMON Blocks:

/ANTECD/, /ATMDAT/, /BACKGD/, /BRNDT/, /CHRCNM/,
/CONSTN/, /DEVICE/, /HEADER/, /INITAL/, /MOLCON/,
/OUTPUT/

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SUBROUTINE CALCUL

Argument Declarations:

ISHINE - INTEGER Vector (Len = Unspecified) (Input) - Sky/earthshine index for source.
Refer to the User Reference Manual for definition.
LENP - INTEGER Vector (Len = Unspecified) (Input) - Path length index
LENP(I) = 0 implies the short path
LENP(I) = 1 implies the long path, if any ambiguity exists
HEADNG - CHARACTER(*) Variable (Input) - User-defined heading
TITLE - CHARACTER(*) Variable (Input) - Title, including version number, date, and time of file generations
FILERT - CHARACTER(*) Variable (Input) - File root
IFLTR - INTEGER Variable (Input) - Filter index
TFLTR - CHARACTER(*) Variable - Filter name
ISMARY - INTEGER Variable (Input) - Summary index

PARAMETER Declarations:

INTEGER NA2MAX, NASMAX, MLMAX, ISMX, NQMAX, NZSMAX, MAXLAT, MAXLON, NL, MLMX2, NVSMAX, ISTMAX, MOLMAX, NTIME
PARAMETER (NQMAX=15, NA2MAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MLMAX=140, MLMX2=2*MLMAX)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (MAXLAT=3, MAXLON=1, NL=50, NVSMAX=20)
PARAMETER (ISTMAX=30000, NTIME=97)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL
CHARACTER*72 IOERR
EXTERNAL PRALC, SCNRCO, OPNSCR, DEVCBD, SUMFIL, SETBCK,
           INDXBK, BRBNDR, SRCFLX, PUTHDR, RESOVL, IOERR,
           SRCIRR, ATMSBD, SRCGEO

Local Variable Declarations:

INTEGER I, L, INITGM, INITV, IOS, JSCENE, IV, KK, LL, IFSCRP,
       JSCENE, ISWOLD, ITYP1, IERR, IP, IGEO, MM, INITVS,
       NSLTO, NLTOT, ISWATM(MAXLAT, MAXLON), ITM,
       KKK, LLL, JX, XX, KL, NTIME
REAL TMIDN(MAXLAT, MAXLON), TNOON(MAXLAT, MAXLON), DV,
       TA, CLDCVP(0:3), TMIDNP, TNOONP, FRNSWP,
       RSOL, RLUNAR, YLAT, YLON, FRWTRP, FRICEP
LOGICAL FLOLD, FLOH

COMMON Blocks: /ATMDAT/, /BRENDT/, /DEVICE/, /FLAGS/, /HEADER/,
               /INITAL/, /PATH1/, /PATH1A/, /PATH4/, /PATH5A/,
               /PATH5B/, /PATH5C/, /PATH5D/, /PATH6/, /PATH8/, 
               /RESTART/
SUBROUTINE CALEND

Argument Declarations:

- **IDAY** - INTEGER Variable (Input/Output) - Day of the month
- **IMONTH** - INTEGER Variable (Input/Output) - Month of the year
- **IYEAR** - INTEGER Variable (Input/Output) - Year
- **IDAYX** - INTEGER Variable (Input/Output) - Day of the year
- **YEAR** - REAL Variable (Output) - Decimal year
- **ITYPE** - INTEGER Variable (Input) - Switch
  - **ITYPE = 0** implies day/month/year input
  - **ITYPE = 1** implies day of year input

INTRINSIC and EXTERNAL Declarations:

- **INTRINSIC**
  - REAL

Local Variable Declarations:

- **INTEGER**
  - **IDYMN(13,2),LPYR,IFYR4,IFYR100,IFYR400,I

COMMON Blocks: None

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SUBROUTINE CHANGE

Argument Declarations:

- **CMOL** - REAL Vector (Len = Unspecified) (Input/Output) - Molecular concentrations (ppmv)
- **CMOLO** - REAL Vector (Len = Unspecified) (Input) - Molecular concentrations at surface (ppmv)
- **MONTH** - INTEGER Variable (Input) - Month of year
- **IYEAR** - INTEGER Variable (Input) - Year
- **XLAT** - REAL Variable (Input) - Latitude (deg)

PARAMETER Declarations:

- **INTEGER**
  - **NVAR6,NXY1,NXY2**
- **PARAMETER**
  - (NVAR6=6, NXY1=44, NXY2=258)

INTRINSIC and EXTERNAL Declarations:

- **REAL**
  - **XTERP**
- **INTRINSIC**
  - REAL
- **EXTERNAL**
  - **XTERP**

Local Variable Declarations:

- **INTEGER**
  - **I,IFRP1**
- **REAL**
  - **YR(NVAR6),CO2(NVAR6),N2O(NVAR6),CH4(NVAR6),CMOLO,CMOLO6,YEAR,CMOLO5,CO,YEAR1(NXY1),CO2X1(NXY1),YEAR2(NXY2),CO2X2(NXY2)**

COMMON Blocks: None
SUBROUTINE CHKRST

Argument Declarations:

NFILE - INTEGER Variable (Input) - File unit number
RESTRT - LOGICAL Variable (Output) - Restart flag
NGEOM - INTEGER Variable (Output) - Geometry index for restart
NREC - INTEGER Variable (Output) - Spectral record index for restart
NRECS - INTEGER Variable (Output) - Spectral subset index for restart

PARAMETER Declarations:

INTEGER NVSMAX, NGMAX
PARAMETER (NVSMAX=20, NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
INTRINSIC MAX
EXTERNAL IOERR

Local Variable Declarations:

INTEGER NHDR(2), IH, NG, IG, NVAR(NGMAX), IV, IVX, IOS, NVSET,
       IGEOM, NV(NVSMAX), IFILE, IVS, IHDR(2000)
REAL HDR(2500), VAR(10000)
CHARACTER*40 HEADING
CHARACTER*80 TITLE

COMMON Blocks: None

SUBROUTINE CHKVER

Argument Declarations:

NFILE - INTEGER Variable (Input/Output) - Device unit number
FILXST - LOGICAL Variable (Input/Output) - Flag for existence of file
HEADING - CHARACTER(*) Variable (Input) - Heading for reference
TITLE - CHARACTER(*) Variable (Input) - Title for reference

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL IOERR

Local Variable Declarations:

INTEGER IOS
CHARACTER*40 HEADNX
CHARACTER*80 TITLX

COMMON Blocks: None
SUBROUTINE CTIME

Argument Declarations:

TIME - REAL Variable (Input/Output) - Decimal time (hours)
IHR - INTEGER Variable (Input/Output) - Hours (hours)
IMN - INTEGER Variable (Input/Output) - Minutes (min)
Value is between 0 and 59.
SEC - REAL Variable (Input/Output) - Seconds (sec)
ITYPE - INTEGER Variable (Input) - Conversion index
ITYPE = 0 implies decimal to Hr, Min, Sec
Otherwise Hr, Min, Sec to decimal.

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, INT

Local Variable Declarations:

REAL XMIN

COMMON Blocks: None

REAL FUNCTION CIREX

Argument Declarations:

TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC ABS, EXP, DBLE, REAL, MAX, MIN, SQRT

Local Variables

INTEGER I
REAL  D0, SIGMAE, SQ3, DIAM(5), WIDTH(5), DL(5)
DOUBLE PRECISION SIZE, FN100, FN1000, TC, FIWC, B1, B2

COMMON Blocks: None
SUBROUTINE CIRRUS

Argument Declarations:

ICIRRUS - INTEGER Variable (Input) - Cirrus cloud index
   ICIRRUS = 0 implies no cirrus clouds
   ICIRRUS = 1 implies standard cirrus clouds
   ICIRRUS = 2 implies subvisual cirrus clouds
   ICIRRUS = 3 implies a Heymsfield cirrus cloud model
CIRBS - REAL Variable (Input/Output) - Cirrus base altitude (km)
CIRTHK - REAL Variable (Input/Output) - Cirrus thickness (km)
CIREXT - REAL Variable (Input) - Extinction at 0.55 μm (km⁻¹)
CIRICE - REAL Variable (Input/Output) - Ice concentration (gm/m³)
ITYPE - INTEGER Variable (Input) - Latitude index
ISEASN - INTEGER Variable (Input) - Season index

INSTRISC and EXTERNAL Declarations:

INTRINSIC MIN

Local Variable Declarations:

INTEGER ISN, I
REAL CAMEAN(10, 2)

COMMON Blocks: None

SUBROUTINE CITIES

Argument Declarations:

XLAT - REAL Variable (Input) - Latitude (deg)
XLOI - REAL Variable (Input) - Longitude (deg)
FLURB - LOGICAL Variable (Output) - Flag for an urban area
URBNAM - CHARACTER(*) Variable (Output) - Name of urban area

PARAMETER Declarations:

INTEGER NCITY
PARAMETER (NCITY=289)

INSTRISC and EXTERNAL Declarations:

INTRINSIC MAX, MIN, INT, LEN, ABS

Local Variable Declarations:

INTEGER I, NLN, IURB(NCITY), LNDX(181), ILAT, ILATM
REAL CLAT(NCITY), CLON(NCITY), DLAT(5), DLOI(5), YLOI
CHARACTER*34 CITYNM(NCITY), BLANKS

COMMON Blocks: None
SUBROUTINE CLDALT

Argument Declarations:

* Z - REAL Vector (Len = Unspecified) (Input) - Altitude profile (km)
T - REAL Vector (Len = Unspecified) (Input) - Temperature profile (K)
NTRPAU - INTEGER Variable (Input) - Position of tropopause in profile
XLAT - REAL Variable (Input) - Latitude (deg)
XLONG - REAL Variable (Input) - Longitude (deg)
MONTH - INTEGER Variable (Input) - Month of year
HOUR - REAL Variable (Input) - Time of day (dec. hours LST)
HB - REAL Variable (Input) - Terrain altitude (km)
CLALT B - REAL Vector (Len = Unspecified) (Input/Output) - Cloud base altitude (km)
CLALTT - REAL Vector (Len = Unspecified) (Input/Output) - Cloud top altitude (km)

INTRINSIC and EXTERNAL Declarations:

REAL            TMPCLD
INTRINSIC       MAX, MIN, ABS, SIGN
EXTERNAL        TMPCLD, RDGEL

Local Variable Declarations:

INTEGER          M, KL, KLB
REAL             TEMP, CLMIN(3), CLHMAX(3), FACTM, DUM, FAC, HTMIN,
                 GMT(2, 2), TSRF(2), FRSNWP, CIRR, CLCV(2, 0:3, 2),
                 CLDRA D(2, 3, 2), PRICEP

COMMON Blocks: None

SUBROUTINE CLDL YR

Argument Declarations:

T - REAL Variable (Output) - Cloud optical depth
B - REAL Variable (Output) - Backscattering fraction
BU - REAL Variable (Output) - Zenith angle dependent backscattering fraction
UO - REAL Variable (Input) - Cosine of solar zenith angle
I - INTEGER Variable (Input) - Atmospheric layer number
CLA - REAL Variable (Output) - Layer cloud fraction
CLDP - REAL Vector (Len = Unspecified) (Input) - Cloud cover (%)  
  1 - Low etage
  2 - Middle etage
  3 - High etage
G - REAL Variable (Output) - Asymmetry factor

INTRINSIC and EXTERNAL Declarations:

REAL            BETA, BETAU
INTRINSIC       MAX
EXTERNAL        BETA, BETAU, BRBNBD

Local Variable Declarations:

REAL            G

COMMON Blocks: /CLDPAR/

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SUBROUTINE CNSTNT

Argument Declarations: None

INTRINSIC and EXTERNAL Declarations:

CIBM INTEGER IBITS
CVAX INTEGER JIBITS
CLAH INTEGER JIBITS
REAL ADD, SUB, MUL, DIV
DOUBLE PRECISION DADD, DSUB, DMUL, DDIV
CUNX REAL PLMIN, PLMAX
CSUN REAL R_MIN_NORMAL, R_MAX_NORMAL
CUNX DOUBLE PRECISION DFLMIN, DFLMAX
CSUN DOUBLE PRECISION D_MIN_NORMAL, D_MAX_NORMAL
INTRINSIC ASIN, DBLE, REAL, INT, ABS, EXP
INTRINSIC IBITS
CUNX INTRINSIC MAX
CVAX INTRINSIC JIBITS
CLAH EXTERNAL JIBITS
CIBM EXTERNAL IBITS
EXTERNAL ADD, SUB, MUL, DIV, DADD, DSUB, DMUL, DDIV

Local Variable Declarations:

INTEGER I, J, K, IZ, MXR, MXD
INTEGER*2 IZ(2)
REAL X, Y, Z, ONER, ZEROR, RADIX, RADINV, A, B
DOUBLE PRECISION DX, DY, DZ, DT, ONED, ZEROD, DRADIX, DRADINV, DA, DB, DC, DD

COMMON Blocks: /CONSTN/

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REAL FUNCTION ADD

Argument Declarations:

X - REAL Variable - First argument
Y - REAL Variable - Second argument

_____________________________________________________

REAL FUNCTION SUB

Argument Declarations:

X - REAL Variable - First argument
Y - REAL Variable - Second argument

_____________________________________________________

REAL FUNCTION MUL

Argument Declarations:

X - REAL Variable - First argument
Y - REAL Variable - Second argument

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REAL FUNCTION DIV

Argument Declarations:

X       - REAL Variable - First argument
Y       - REAL Variable - Second argument

DOUBLE PRECISION FUNCTION DADD

Argument Declarations:

DX      - DOUBLE PRECISION Variable - First argument
DY      - DOUBLE PRECISION Variable - Second argument

DOUBLE PRECISION FUNCTION DSUB

Argument Declarations:

DX      - DOUBLE PRECISION Variable - First argument
DY      - DOUBLE PRECISION Variable - Second argument

DOUBLE PRECISION FUNCTION DMUL

Argument Declarations:

DX      - DOUBLE PRECISION Variable - First argument
DY      - DOUBLE PRECISION Variable - Second argument

DOUBLE PRECISION FUNCTION DDIV

Argument Declarations:

DX      - DOUBLE PRECISION Variable - First argument
DY      - DOUBLE PRECISION Variable - Second argument
CIBM INTEGER FUNCTION IBITS

Argument Declarations:

I - INTEGER Variable - Input variable
J - INTEGER Variable - Initial position for extracting bits
K - INTEGER Variable - Number of bits to be extracted

INTRINSIC and EXTERNAL Declarations:

CIBM INTEGER IBSET, IBCLR
CIBM LOGICAL BTST
CIBM INTRINSIC IBSET, IBCLR, BTST

Local Variable Declarations:

CIBM INTEGER N, NBITS

COMMON Blocks: None

SUBROUTINE COAT

Argument Declarations:

RADCOR - REAL Variable (Input) - Core radius (µm)
RADCOT - REAL Variable (Input) - Coating radius (µm)
WL - REAL Variable (Input) - Wavelength (µm)
XNP - COMPLEX Vector (Len = Unspecified) (Input) - Complex
      indices of refraction of core and coating
RN0 - COMPLEX Variable (Input) - Complex index of refraction of the
      medium
NSANGL - INTEGER Variable (Input) - Number of scattering angles
QABSP - REAL Variable (Output) - Absorption coefficient (km⁻¹ per
      (particles cm⁻³))
QSCAT - REAL Variable (Output) - Absorption coefficient (km⁻¹ per
      (particles cm⁻³))
QQSCAT - REAL Variable (Output) - Asymmetry coefficient times QSCAT

PARAMETER Declarations:

INTEGER NXMIE
PARAMETER (NXMIE=101)

INTRINSIC and EXTERNAL Declarations:

INTEGER NCYCLE
INTRINSIC REAL, CMPLX, AIMAG, ABS, CONJG, INT, COS, SIN
EXTERNAL NCYCLE

Local Variable Declarations:

INTEGER N, NSTOP, N1, N2, ML, M2, M3, J, JJ, NS2
REAL X, Y, PN, CHIT(3), PSIY(3), P, T, DUM, TAU, QEXT
LOGICAL FLAG
COMPLEX RFREL(2), AN(2), EN(2), REFREL, CN, C2NM1, X1, X2, Y2,
      CONE, DNBAR, GNBAR, CRACK, BRACK, DX1(2), DX2(2),
      DY2(2), XY(3), CHIK2(3), CHIPX2, CHIY2(3),
      CHIPY2, DUMC(4)

COMMON Blocks: /*CONSTN*/, /*MIECOT*/
REAL FUNCTION COMFNC

Argument Declarations:

* XN - REAL Variable - Optical depth
ACNP - REAL Variable - Summing variable for Lorentz line width
ACND - REAL Variable - Summing variable for Doppler line width
IV - INTEGER Variable - Switch for Doppler/Lorentz line shape
    IV = 0 implies a Lorentz line shape
    IV = 1 implies a Doppler line shape

INTRINSIC and EXTERNAL Declarations:

INTRINSIC                  SQRT, LOG, REAL, DPROD

Local Variable Declarations:

REAL                      TEST, DENC, DEND, COMC, COMD, YN
DOUBLE PRECISION         XN2

COMMON Blocks:            /CONSTN/

SUBROUTINE CONFIG

Argument Declarations: None

INTRINSIC and EXTERNAL Declarations:

CSUN  EXTERNAL           IEEE_HANDLER, ERROR_HANDLER
CIBMV EXTERNAL           ERRSET
CLAH EXTERNAL            UNDER0

Local Variable Declarations:

CSUN  INTEGER           N

COMMON Blocks: None

CSUN  INTEGER FUNCTION ERROR_HANDLER

Argument Declarations:

SIG   - INTEGER Variable -
CODE  - INTEGER Variable - Error code index
CMYEXC  INTEGER Vector (Len = Unspecified) -

Local Variable Declarations:

CSUN  CHARACTER*14  LABEL

COMMON Blocks: None
SUBROUTINE COUPLE

Argument Declarations:

V    - REAL Variable (Input) - Wavenumber (cm⁻¹)
DV   - REAL Variable (Input) - Wavenumber increment (cm⁻¹)
IScene - INTEGER Array (Dim = MAXLAT x Unspecified) (Input) - Background scene index
NMolec - INTEGER Variable (Input) - Number of molecules
ISWATM - INTEGER Array (Dim = MAXLAT x Unspecified) (Input) - Switch for model atmospheres

PARAMETER Declarations:

INTEGER                MLMAX, NAZMAX, NASMAX, ISMX, NBAND, NZSMAX, NMATL, MAXLAT, MAXLON, NGMAX, NVSMAX, MOLMAX
PARAMETER (MLMAX=140, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, NBAND=16)
PARAMETER (NMATL=28)
PARAMETER (MAXLAT=3, MAXLON=1)
PARAMETER (NGMAX=15, NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
INTRINSIC MAX, SIN, ABS, MIN
EXTERNAL XTERP, BCKGD, PROFAC, INICPL, BKGDBD

Local Variable Declarations:

INTEGER I, L, K, M, LTER, KEY, KEYP, LP, MLP, ITER, NPTS, LTOP, MTOP, LERR, KK, LL, ITRP0, ISPACE, XX, LX, NBCK (2, 2)
REAL EMISS, HP0 (2), HPX (MLMAX, NBAND), HMX (MLMAX, NBAND), EMBCX, EMSPAC, REFECK, WL, DUM1, DUM2, HSOLAR, CC, HLMN, PROJL (6), RADRF, HPOLD (0:MLMAX+1), FAC, HMLD (0:MLMAX+1), ERR, ERRF, ERRM, REF0, PROJS (6), BCKFAC (MAXLAT, MAXLON), BCKSUM (6, NMATL), HSKY0, PRJS1 (6), HLMN0, PRJL1 (6), TAUL, PS90, PL90, PB90, AZ90, AZS90, AZL90, HSCAT0, HSLR0, DUM, SHDRS, SHDLW
CHARACTER*7 HTYPE (2)

COMMON Blocks: /BACKGD/, /CONSTN/, /HEADER/, /INITAL/, /LYRSTO/, /MSPARM/, /PATH4/

REAL FUNCTION CSPHFN

Argument Declarations:

ASYM - REAL Variable - Asymmetry factor
THETA - REAL Variable - Scattering angle (deg)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC COS, INT, REAL, MAX, MIN, SQRT

Local Variable Declarations:

INTEGER I, IG, IGP
REAL G, GCS (-200:200), FAC, G2, CST

COMMON Blocks: /CONSTN/
REAL FUNCTION DBANDS

Argument Declarations:

XMLBDA - REAL Variable - Ecliptic longitude (deg)
BETA - REAL Variable - Ecliptic latitude (deg)
LABSUN - REAL Variable -
V - REAL Variable - Wavenumber (cm⁻¹)
DV - REAL Variable - Wavenumber increment (cm⁻¹)

INTRINSIC and EXTERNAL Declarations:

REAL ZLAT, SOLAR, PLANCK
    REAL, ABS, MIN
    EXTERNAL PLANCK, SOLAR, ZLAT, ZOD2BD

Local Variable Declarations:

INTEGER I, IRBC, IRECP
REAL FAC, REC, AU, DUM, SRC, RSOL, RSUN, SCAT, THERM
COMMON Blocks: /ZODBND/

SUBROUTINE DBINIT

Argument Declarations: None

PARAMETER Declarations:

INTEGER MOLMAX, MLIDMX
    PARAMETER (MOLMAX=26, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
    INTRINSIC INT, INDEX, LEN, ABS
    EXTERNAL DEVCBD, IOERR

Local Variable Declarations:

INTEGER I, IRBC, IRECP
    INTEGER LRECL, IERR
    REAL DUMMY
CHARACTER*120 FILE

COMMON Blocks: /CONSTN/, /DEVCMN/, /DEVICE/, /MOLEC/
REAL FUNCTION DDIF

Argument Declarations:

U2 - REAL Variable - Upward flux, layer 2
U3 - REAL Variable - Upward flux, layer 3
D1 - REAL Variable - Downward flux, layer 1
D2 - REAL Variable - Downward flux, layer 2
D3 - REAL Variable - Downward flux, layer 3
R1S - REAL Variable - Directional reflection coefficient, layer 1
R2S - REAL Variable - Diffuse reflection coefficient, layer 2
R2S - REAL Variable - Directional reflection coefficient, layer 2
T2 - REAL Variable - Transmission, layer 2
T3 - REAL Variable - Transmission, layer 3
G - REAL Variable - Composite R and T from FUNCTION GAM

Local Variable Declarations:

REAL T,R,RR

COMMON Blocks: None

SUBROUTINE DEFAUT

Argument Declarations:

ISWINP - INTEGER Vector (Len = Unspecified) (Input) - Input switches
IPLTR - INTEGER Variable (Output) - Filter index
ISHINE - INTEGER Variable (Output) - Earth/skyshine index
NXTRA - INTEGER Variable (Output) - Number of extra altitudes

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, NANTMX, MLMAX,
        MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX
PARAMETER (NGMAX=15, NASMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (NANTMX=25, NVSMAX=20)
PARAMETER (MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC ABS, AINT, SIGN, MOD, MAX
EXTERNAL EXOATM, GBLCK, DEVCBD

Local Variable Declarations:

INTEGER I, ISCENE, IXOTMP, KK, LL
REAL TMIDN, TNOON, TSURF, FRSNW, FRWTR, CLDCVP(0:3)

COMMON Blocks: /ANTECD/, /DEVICE/, /HEADER/, /USERDF/

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SUBROUTINE DEFBCK

Argument Declarations:

* NSRCE - INTEGER Variable (Input) - Position index for source
* THETA - REAL Variable (Input) - Source-background earth-center angle (deg)
* JBGD - INTEGER Variable (Input) - Background index
* JGEM - INTEGER Variable (Input) - Geometry number
* FRSNW - REAL Vector (Len = Unspecified) - Percentage snow at end of line-of-sight (%)
* FRICE - REAL Vector (Len = Unspecified) - Percentage ice at end of line-of-sight (%)
* FRWTR - REAL Vector (Len = Unspecified) - Percentage water at end of line-of-sight (%)

PARAMETER Declarations:

INTEGER MMAX,MLMX2,NAZMAX,NASMAX,NGMAX,NZSMAX,NVSMAX,
       MAXLAT,MAXLON,ISMX,MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MLMAX=140, MLMX2=2*MLMAX)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

EXTERNAL BCKCHK, INDBK, SPTRIG, SETBCK

Local Variable Declarations:

INTEGER I, MM, NLOCAT
REAL XLA2P, XLONP, TAIRP, CLDCPF(0:3), TDUM, TMIDN, TNOON,
     AZP, SOLAZP, FRSNWPF, FRICEPF, FRWTPF

COMMON Blocks:

/HEADER/, /PATH5A/, /PATH5C/
SUBROUTINE DEMSXX

Argument Declarations:

IGRND - INTEGER Variable (Input) - Material index
V - REAL Variable (Input) - Wavenumber (cm⁻¹)
DV - REAL Variable (Input) - Wavenumber increment (cm⁻¹)
TEMP - REAL Vector (Len = 0:Unspecified) (Input) - Temperature of each layer in material (K)
EMV - REAL Variable (Output) - Emissivity for vertical polarization
EMH - REAL Variable (Output) - Emissivity for horizontal polarization
ANGLE - REAL Variable (Input) - Elevation angle (deg)
DH - REAL Variable (Input) - Standard deviation of the distribution of heights (m)
IRGH - INTEGER Variable (Input) - Roughness type

PARAMETER Declarations:

INTEGER NLMAX
PARAMETER (NLMAX=10)

INTRINSIC and EXTERNAL Declarations:

COMPLEX EMTREF, SEAWTR, INDEXW, INDEXI
INTRINSIC CMPLX, AIMAG, MAX, DBLE, DPROD, EXP, REAL, ABS, SQRT, SIN
EXTERNAL DIREMS, EMTREF, INDEXI, INDEXW, SEAWTR, SOIL, EMISBD

Local Variable Declarations:

INTEGER NLAYER, ITYPE, NINCL, IGRD
REAL WL, DELS
COMPLEX DSOIL, AIR, WATER, ICE, INEF(0:NLMAX), INDEX(2)

COMMON Blocks: /CDRYDS/, /WETNES/

REAL FUNCTION DENAIR

Argument Declarations:

P - REAL Variable - Pressure (mb)
T - REAL Variable - Temperature (K)
CMOL - REAL Vector (Len = Unspecified) - Molecular concentrations (ppm)

PARAMETER Declarations:

INTEGER MLIDMX
PARAMETER (MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

REAL VIRIAL
EXTERNAL VIRIAL, MOPBD

Local Variable Declarations:

INTEGER K
REAL RSTAR, P0, XMAIR, V2, V3

COMMON Blocks: /MOLDAT/
REAL FUNCTION DENWTR

Argument Declarations:

TEMP   - REAL Variable - Temperature (K)

PARAMETER Declarations:

INTEGER NPTS
PARAMETER (NPTS=56)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
EXTERNAL XTERP

Local Variable Declarations:

INTEGER ITRP0
REAL T(NPTS),DEN(NPTS)
REAL TC

COMMON Blocks: None

REAL FUNCTION DEPOL

Argument Declarations:

WL   - REAL Variable - Wavelength (μm)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
EXTERNAL XTERP

Local Variable Declarations:

REAL WLD(36),DPL(36)

COMMON Blocks: None
DOUBLE PRECISION FUNCTION DERF

Argument Declarations:

DX - DOUBLE PRECISION Variable - Argument of error function

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, MIN, EXP, ABS

Local Variable Declarations:

DOUBLE PRECISION A(5), T, P, DUM

COMMON Blocks: None

SUBROUTINE DESAER

Argument Declarations:

WSPD - REAL Variable (Input) - Wind speed at 10 m altitude (m/sec)
VIS - REAL Variable (Output) - Meteorological range (km)
DESEXT - REAL Vector (Len = Unspecified) (Output) - Extinction coefficient (km\(^{-1}\))
DESABS - REAL Vector (Len = Unspecified) (Output) - Absorption coefficient (km\(^{-1}\))
ASYMD - REAL Vector (Len = Unspecified) (Output) - Asymmetry factor

PARAMETER Declarations:

INTEGER NWLAER
PARAMETER (NWLAER=47)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC INT, MIN
EXTERNAL DSRTED

Local Variable Declarations:

INTEGER I, NWSPD
REAL EXT55, RAYSCT, WIND(4), FAC, DWND

COMMON Blocks: /CONSTN/ , /DESDAT/
SUBROUTINE DFLT2

Argument Declarations:

ITYPE - INTEGER Variable (Input) - Latitude index
ISBASN - INTEGER Variable (Input/Output) - Season index
IAERO1 - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) -
Boundary layer aerosol index
IAERO2 - INTEGER Variable (Input/Output) - Stratospheric aerosol index
IHAZE - INTEGER Variable (Input/Output) - Haze profile index
IUPPER - INTEGER Variable (Input/Output) - Upper haze profile index
ISMX - INTEGER Variable (Input) - Maximum DIMENSION of MC
MP - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) -
Pressure profile index
MT - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) -
Temperature profile index
MC - INTEGER Array (Dim = ISMX x MAXLAT x Unspecified)
   (Input/Output) - Molecular concentration profile index
MA - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) -
Model atmosphere index
VIS - REAL Array (Dim = MAXLAT x Unspecified) (Input/Output) -
Sea-level visible range (km)
RE - DOUBLE PRECISION Variable (Output) - Earth radius (km)
MONTH - INTEGER Variable (Input) - Month of the year (Jan =1,...)
XLAT - REAL Variable (Input) - Latitude (deg)
XLONG - REAL Variable (Input) - Longitude (deg)
LATSTR - REAL Vector (Len = Unspecified) (Output) - Latitude of the
   model atmosphere.
LONSTR - REAL Vector (Len = Unspecified) (Output) - Longitude of the
   model atmosphere.
NLAT - INTEGER Variable (Output) - Number of latitudes
NLONG - INTEGER Variable (Output) - Number of longitudes
IBKGD - INTEGER Variable (Input) - Background index
HBCK - REAL Variable (Input) - Terrain altitude (km)

PARAMETER Declarations:

INTEGER                     NL,MAXLAT,MAXLON
PARAMETER                  (NL=50, MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

INTEGER        MDLATM,IDAERO
INTRINSIC      ABS,SORT,COS,SIN,MIN,DOUBLE,INT
EXTERNAL       ATMSBD,MDLATM,IDAERO

Local Variable Declarations:

INTEGER            K,KK,LL,ITYPE0,JTYPE

COMMON Blocks:       /ATMDAT/, /CONSTN/
SUBROUTINE DPLT8

Argument Declarations:

V1 - REAL Vector (Len = Unspecified) (Input/Output) - Initial wavenumber (cm\(^{-1}\) or micron)
V2 - REAL Vector (Len = Unspecified) (Input/Output) - Final wavenumber (cm\(^{-1}\) or micron)
DVI - REAL Vector (Len = Unspecified) (Input/Output) - Calculation width (cm\(^{-1}\))
IDV - INTEGER Vector (Len = Unspecified) (Input) - Wavenumber/ Wavelength index
  IDV = 1 implies wavenumber (cm\(^{-1}\))
  IDV = 2 implies wavelength (micron)
DWL - REAL Vector (Len = Unspecified) (Output) - Calculation width (micron)
NV - INTEGER Variable (Output) - Number of wavenumber sets of values
NVMAX - INTEGER Variable (Input) - Maximum number of wavenumber sets of values
ISPCAL - INTEGER Variable (Output) - Spectral calculation index
  ISPCAL = 1 implies 2 cm\(^{-1}\) band parameters
  ISPCAL = 3 implies line-by-line millimeter wave parameters

PARAMETER Declarations:

INTEGER MOLMAX, MLIDMX
PARAMETER (MOLMAX=26, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

REAL DVINCR
CHARACTER*2 UPCASE
INTRINSIC MAX, MIN, ABS, AINT
EXTERNAL DVINCR, RDLINE, GETVEC, UPCASE, DEVCBD

Local Variable Declarations:

INTEGER I, L,N1,N2,N3
REAL VR(2), VI, VF, VX, DVX
CHARACTER*255 VARIAB, VARS1, VARS2, VARS3

COMMON Blocks: /CONSTN//, /DEVICE//, /MOLEC/
COMPLEX FUNCTION DIREFL

Argument Declarations:

- DOTPR - REAL Variable - Dot product of incident vector to surface normal
- DIELEC - COMPLEX Variable - Permittivity (dielectric constant and conductivity) of surface
- XMU - COMPLEX Variable - Permeability of surface
- IPOLAR - INTEGER Variable - Polarization index
  - IPOLAR = 1 implies polarization parallel to surface
  - IPOLAR = 2 implies polarization normal to surface

INTRINSIC and EXTERNAL Declarations:

- INTRINSIC CMPLX,SQRT

Local Variable Declarations:

- COMPLEX E_P,CCST

COMMON Blocks: None

SUBROUTINE DISEND

Argument Declarations:

- IFDIS - INTEGER Variable (Input) - File number for DIS file

PARAMETER Declarations:

- INTEGER NVSMAX,NGMAX
- PARAMETER (NVSMAX=20, NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

- CHARACTER*72 IOERR
- EXTERNAL IOERR

Local Variable Declarations:

- INTEGER NHDR(2),NVAR(NGMAX),IV,IVSET,IVS,IG,NVSET,
  + NVS(NVSMAX),IH,IOS,ICHK,IHDR(6000),
  + NGEOM,IGEOM
- REAL HDR(7500),VAR(10000)
- CHARACTER*40 HEADNG
- CHARACTER*80 TITLE
- EQUIVALENCE (NGEOM,IHDR(1)),(NVSET,IHDR(2)),
  + (NVS(1),IHDR(3))
SUBROUTINE DISPRN

Argument Declarations:

IFDIS - INTEGER Variable (Input) - File number for DIS file
IGEOM - INTEGER Variable (Input) - Number of geometry
NAZ - INTEGER Vector (Len = Unspecified) (Input) - Number of
observer azimuths
NASPCT - INTEGER Vector (Len = Unspecified) (Input) - Number of
earth/skyshine elevation angles
NAZSH - INTEGER Variable (Input) - Number of earth/skyshine
azimuth angles

PARAMETER Declarations:

INTEGER NGMAX, NAZMAX, NASMAX, NZSMAX, NMATL, MAXLAT,
+ MAXLON, MLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (NMATL=28)
PARAMETER (MAXLAT=3, MAXLON=1)
PARAMETER (MLMAX=100)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL IOERR

Local Variable Declarations:

INTEGER L, M, MM, IOS

COMMON Blocks: /BCKDAT/, /INTSTO/

REAL FUNCTION DNDR

Argument Declarations:

RADN - REAL Vector (Len = Unspecified) - Midpoints of the radii
intervals (microns)
IMATRL - INTEGER Variable - Particle material index
TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL GAMMLN
INTRINSIC REAL, EXP, LOG, SQRT, MAX, MIN, INT, AINT, ABS, DBLE
EXTERNAL GAMMLN

Local Variable Declarations:

INTEGER I, IP
REAL TSSQ, SUM, CON, DR, XI, FAC, RATE, GAM, D0, DP, R0P,
+ DIAM(5), DL(5), SIZEN
DOUBLE PRECISION FN100, FN1000, B1, B2

COMMON Blocks: /CONSTN/, /MATERL/
REAL FUNCTION DPLDT

Argument Declarations:

TEMP - REAL Variable - Temperature (K)
V    - REAL Variable - Wavenumber (cm\(^{-1}\))
DV   - REAL Variable - Wavenumber increment (cm\(^{-1}\))

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, DBLE, EXP, DPROD, LOG

Local Variable Declarations:

INTEGER I
REAL VP
DOUBLE PRECISION X, Y, C1, C2, XMU(3), WT(3), DPL

COMMON Blocks: /CONSTN/

SUBROUTINE DRTLAY

Argument Declarations:

R    - REAL Variable (Output) - Reflection coefficient
T    - REAL Variable (Output) - Transmission coefficient
BU   - REAL Variable (Input) - Backscatter coefficient
PHI  - REAL Variable (Input) - Elevation angle (deg)
W    - REAL Variable (Input) - Scattering albedo
TAU  - REAL Variable (Input) - Layer optical depth
RE   - DOUBLE PRECISION Variable (Input) - Radius of the earth (km)
ZM   - REAL Variable (Input) - Prior altitude (km)
Z    - REAL Variable (Input) - Altitude of interest (km)
ZP   - REAL Variable (Input) - Next altitude (km)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SQRT, EXP, ABS, DBLE, REAL, SIN

Local Variable Declarations:

REAL U, EM, G

COMMON Blocks: /CONSTN/
REAL FUNCTION DVINCR

Argument Declarations:

V    - REAL Variable  - Wavenumber (cm⁻¹)
DVI   - REAL Variable  - Initial wavenumber increment (cm⁻¹)
IDV   - INTEGER Variable  - Wavenumber/wavelength index
IDV = 1 implies wavenumber (cm⁻¹)
IDV = 2 implies wavelength (micron)
IDV = 3 implies frequency (GHz)
DWL   - REAL Variable  - Wavelength increment (micron)

PARAMETER Declarations:

INTEGER MOLMAX, MLIDMX
PARAMETER (MOLMAX=26, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC AINT, MAX
COMMON Blocks: /MOLECP/

SUBROUTINE ECLGAL

Argument Declarations:

ALPHA   - REAL Variable (Input)  - Ecliptic azimuth (deg)
DELTA   - REAL Variable (Input)  - Ecliptic elevation (deg)
XL       - REAL Variable (Output)  - Galactic azimuth (deg)
XB       - REAL Variable (Output)  - Galactic elevation (deg)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SIN, COS, ATAN2, ABS

Local Variable Declarations:

REAL CSA, SNA, CSD, SND, CS0, SN0, DUM1, DUM2, DUM3, XLP, XBP,
      CSL, SNL

COMMON Blocks: /CONSTN/
REAL FUNCTION EHBSL0

Argument Declarations:

X - REAL Variable - Argument

INTRINSIC and EXTERNAL Declarations:

DOUBLE PRECISION POLY
INTRINSIC DBLE,ABS,EXP,SQRT,REAL
EXTERNAL POLY

Local Variable Declarations:

DOUBLE PRECISION C1(7),C2(9),T,T1,T2

COMMON Blocks: None

REAL FUNCTION EMISSV

Argument Declarations:

R - REAL Variable - Distance from sun
V - REAL Variable - Wavenumber (cm$^{-1}$)

PARAMETER Declarations:

INTEGER MOLMAX, MLIDMX
PARAMETER (MOLMAX=26, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

REAL SOLAR, PLANCK
INTRINSIC MAX, MIN, INT, LOG10, REAL
EXTERNAL ZOD1BD, SOLAR, PLANCK

Local Variable Declarations:

INTEGER IW, IWF, ICEN, ICENP
REAL DMIN, DMAX, DSLOPE, ALINE, FACW, FACD, C, AWL,
     SOLDIS, V1, V2, TEMP

COMMON Blocks: /MOLECP,,SILEMS/

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COMPLEX FUNCTION EMTREF

Argument Declarations:

INDEXM - COMPLEX Variable - Index of refraction of matrix
INDEXI - COMPLEX Vector (Len = Unspecified) - Index of refraction of inclusions
F - REAL Vector (Len = Unspecified) - Volume fraction of inclusions
NINCL - INTEGER Variable - Number of inclusion types
ITYPE - INTEGER Variable - Type of mixture
  ITYPE = 0 implies the Bruggeman effective medium theory which applies to a two-component mixture in which there are no distinguishable inclusions embedded in a definite matrix
  ITYPE = 1 implies Maxwell-Garnett theory for spherical inclusions in a matrix
  ITYPE = 2 implies the Lorentz-Lorenz form of the Clausius-Mosotti equation for a mixture; this equation holds for gases, but is only an approximation for liquids (i.e., it fails near strong absorption bands)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SQRT,CMPLX

Local Variable Declarations:

INTEGER I
COMPLEX E,EM,VF,BETA,EAV,C1,C2,DUM

COMMON Blocks: None
SUBROUTINE ENDPT

Argument Declarations:

- R - REAL Vector (Len = Unspecified) (Input/Output) - Slant range (km)
- THETA - REAL Vector (Len = Unspecified) (Input/Output) - Earth center angle (rad)
- PHI - REAL Vector (Len = Unspecified) (Input/Output) - Elevation angle (rad)
- IZ - INTEGER Vector (Len = Unspecified) (Input/Output) - Altitude index
- LLST - INTEGER Variable (Input) - Location of last valid point on ray
- SLRNG - REAL Variable (Input) - Total slant range (km)
- BETA - REAL Variable (Input) - Total earth center angle (deg)
- JTPGM - INTEGER Variable (Input) - Type of calculation
  - JTPGM = 5 implies slant range is specified
  - JTPGM = 6 implies earth center angle is specified
  - JTPGM = 9 implies earth center angle is specified
- HSEND - REAL Variable (Output) - End point altitude (km)
- IERR - INTEGER Variable (Output) - Error index
  - IERR = 0 implies no error encountered
  - IERR = -1 implies initial value exceeds specified value or final value does not exceed specified value

PARAMETER Declarations:

- INTEGER MLMAX, ISMX, NNNMAX, NAZMAX, NASMAX, NGAS, NGMAX,
  - NZSMAX, MAXLAT, MAXLON, NPTS, NVSMAX, NVSA, MOLMAX,
  - MLIDX
- PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
- PARAMETER (MLMAX=140, NNNMAX=5, NGAS=6)
- PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLIDX=45)
- PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20, NVSA=9)
- PARAMETER (NPTS=2000)

INTRINSIC and EXTERNAL Declarations:

- INTEGER ISTAER
- REAL STRCN2, XTERP, HAZE
- INTRINSIC REAL, DBLE, MAX, MIN, COS, ACOS, SIN, SQRT, SIGN, INT, ABS
- EXTERNAL STRCN2, XTERP, EQABS, ISTAER, MOLPB, AERSOL, HYDROM, HAZE, CLDRBD

Local Variable Declarations:

- INTEGER I, J, K, L, MLP, KK, LL, IDRCT, JM, MLX, KL, JDRCT, KPHI,
  - IZI (NPTS), ITRPAU (MAXLAT, MAXLON), ITRPO,
  - ISTPAU (MAXLAT, MAXLON), JMM, JP, KLAT, KLN,
  - IPRINT
- REAL WL, DTDPJ (NPTS), XMHI (NPTS), XDRCT, VISX, VI, VF,
  - DZL, PLI, TLI, RHLI, WI (ISMX), PRTPFI (ISMX),
  - CMOLI (ISMX), PLUMIF (NNNMAX, NGAS),
  - PLUMIG (NGAS), FAC, TAV, FACICE, FACSNW, DUM, ZLP
- DOUBLE PRECISION MH, MHN, SNELL, TD, RD, PX (NPTS), DMDH, DXMHI, DXMH2,
  - DPHII, DPHI2, RX, PXO, DFAC, DRD, DTD, XMHO
- LOGICAL DUPLIC

COMMON Blocks:

/CLDRN/, /CONSTN/, /HEADER/, /INITIAL/, /MOLCON/,
/MOLECP/, /PLMDAT/, /VSADTA/
SUBROUTINE EPHEML

Argument Declarations:

LATIT - REAL Variable (Input) - Geographical Latitude of observer (deg)
  (+ implies North)
LONG - REAL Variable (Input) - Geographical Longitude of observer (deg)
  (+ implies East)
LONSUN - DOUBLE PRECISION Variable (Input) - Longitude of the sun (deg)
LABSUN - DOUBLE PRECISION Variable (Input) - Mean ecliptic longitude of the
  sun (deg)
PERSUN - DOUBLE PRECISION Variable (Input) - Mean perigee of the sun (deg)
OBLIQ - DOUBLE PRECISION Variable (Input) - Obliquity of the ecliptic (deg)
SOLEV - REAL Variable (Input) - Elevation of sun (deg)
SOLAZ - REAL Variable (Input) - Azimuth of sun (deg)
  0.0 implies North (or undefined)
  90.0 implies East
  180.0 implies South
  270.0 implies West
SOLDIS - REAL Variable (Input) - Earth-sun distance normalized by mean
distance
XLUNEV - REAL Variable (Output) - Elevation of moon (deg)
XLUNAZ - REAL Variable (Output) - Azimuth of moon (deg)
  0.0 implies North (or undefined)
  90.0 implies East
  180.0 implies South
  270.0 implies West
PHLUNR - REAL Variable (Output) - Lunar phase (deg)
  0.0 implies new moon
  90.0 implies first quarter
  180.0 implies full moon
  270.0 implies last quarter
  360.0 implies new moon
XLNDIS - REAL Variable (Output) - Earth-moon distance normalized
  by the mean distance
IECL - INTEGER Variable (Output) - Lunar eclipse index
  IECL = 0 implies no lunar eclipse
  IECL = 1 implies that a lunar eclipse is likely to affect the
calculations. Consult an almanac. If there is no
eclipse, the output will be reliable.
IBCS - INTEGER Variable (Output) - Solar eclipse index
  IBCS = 0 implies no solar eclipse
  IBCS = 1 implies that a solar eclipse is likely to affect the
calculations. Consult an almanac. If there is no
eclipse, the output will be reliable.
ETIME - DOUBLE PRECISION Variable (Input) - Ephemeris time since
  Jan 1 1900, 12:00 Noon, GMT (days)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, MAX, MIN, SIN, COS, ASIN, ACOS, ATAN2, SIGN,
  ABS, DBLE, ATAN, MOD
EXTERNAL LUNPD

Local Variable Declarations:

INTEGER I
REAL LHSE, LHMOON, LOCEL, MOORAD, ARGUN, TINMOO, PARM, SUNR, ERMAX,
  GHSUN, GHMOON, DECMO, PARA, DIPLON, TEMP16,
  TEMP17, DUNM, PARLAX, AZIMOO, DECSUN, XS, YS, ZS, XM, YM, ZM,
  GELOG, SUNMOO, CRITEL, THETA
DOUBLE PRECISION GARI, LONMOO, LATM, LABMOO, PORM, NODMOO,
  CENT, DUN, BLM, BLS, BRP, BRD, RATE, DAYPR

COMMON Blocks: /CONSTN/, /PERLUN/
SUBROUTINE EPHEMS

Argument Declarations:

LAT   - REAL Variable (Input) - Latitude (in degrees and fractions of degrees, is north)
LONG  - REAL Variable (Input) - Longitude (in degrees and fractions of degrees, is east)
DAY   - INTEGER Variable (Input) - Day of the month
MONTH - INTEGER Variable (Input) - Month of the year
YEAR  - INTEGER Variable (Input) - Year
TIME  - REAL Variable (Input) - Time (decimal) local standard (LST) or Greenwich mean (GMT)
ITIME - INTEGER Variable (Input) - Time index
       ITIME = 0 implies local standard time
       ITIME = 1 implies Greenwich mean time
       ITIME = 2 implies local daylight savings time
SOLAZ - REAL Variable (Output) - Azimuth angle (in degrees and fractions of a degree)
       0.0 implies north (or undefined)
       90.0 implies east
       180.0 implies south
       270.0 implies west
SOLERV - REAL Variable (Output) - Elevation angle (in degrees and fractions of a degree)
SOLDIS - REAL Variable (Output) - Normalized solar-earth distance
       SOLDIS = 1.0 implies the mean distance
XLUNES - REAL Variable (Output) - Lunar elevation (deg)
XLUNAZ - REAL Variable (Output) - Lunar azimuth (deg)
       0.0 implies north (or undefined)
       90.0 implies east
       180.0 implies south
       270.0 implies west
XLUNDS - REAL Variable (Output) - Normalized lunar distance
PHELJR - REAL Variable (Output) - Lunar phase (deg)
NLAT  - INTEGER Variable (Input) - Number of latitudes
NLON  - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER   MLMAX, ISMX, MAXLAT, MAXLON, NGMAX, MOLMAX
PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15)

INSTRINSIC and EXTERNAL Declarations:

REAL      SLPOS
DOUBLE PRECISION EPHTIM
INSTRINSIC  ABS, SIN, COS, MOD, INT, SIGN, ASIN, ACOS, TAN,
            REAL, ATAN, DBLE, SQRT, MAX, MIN
EXTERNAL   PLANET, EPHEML, SPTRIG, SLPOS, EPHTIM

Local Variable Declarations:

INTEGER   I, J, ICLE, ICES
REAL      LHA, DCIR, ZNLONG, GMTDEG, ERR, APPLON, RASC, DUMX,
          PSZ, ECCEN, TRANOM, ABBERR, OBLQM, ECANOM, DAYCUT,
          ASCMN, SOLAT, APRASC, EQTIME, HRANG, DECLIN, DECL,
          BETA0, BETAL, DUMMY, TANOM, TEMP
DOUBLE PRECISION LONSUN, LABSUN, PERSUN, OBLIQ, CENT, DPHI, A, XMNLAT,
                DDCIR, ANOM, PERTUB, PERVER, PERPUP, OBLNUT, ETIME

COMMON Blocks:  /CONSTN/, /FLAGS/, /INITAL/
DOUBLE PRECISION FUNCTION EPHTIM

Argument Declarations:

DAY    - INTEGER Variable (Input) - Day of the month
MONTH  - INTEGER Variable (Input) - Month of the year
YEAR   - INTEGER Variable (Input) - Year
TIME   - REAL Variable (Input) - Time (decimal) local standard (LST)
         or Greenwich mean (GMT)
ITIME  - INTEGER Variable (Input) - Time index
         ITIME = 0 implies local standard time
         ITIME = 1 implies Greenwich mean time
         ITIME = 2 implies local daylight savings time

PARAMETER Declarations:

INTEGER          NYRMAX
PARAMETER        (NYRMAX=175)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC        ABS,AINT,INT,SIGN,REAL,DBLE,MAX,MIN

Local Variable Declarations:

INTEGER          I,J,IYR
REAL             DT(NYRMAX),DYG,FAC,YR1,YR2,TEMP,DYCINT,ZNLONG,
                 GMTDEG,DCIR

DOUBLE PRECISION UTIME,CENT,DDCIR

COMMON Blocks: None
SUBROUTINE EQABS

Argument Declarations:

* ZL - REAL Variable (Input) - Altitude (km)
* PL - REAL Variable (Output) - Pressure (mb)
* TL - REAL Variable (Output) - Temperature (K)
* RHL - REAL Variable (Output) - Relative humidity
* XMH - REAL Variable (Output) - Refractive bending constant
* W - REAL Vector (Len = Unspecified) (Output) - Equivalent absorber amounts (km^-1)
* PRTNFN - REAL Vector (Len = Unspecified) (Output) - Partition function for each molecule
* RE - DOUBLE PRECISION Variable (Input) - Radius of the earth (km)
* WL - REAL Variable (Input) - Wavelength (μm)
* CMOLL - REAL Vector (Len = Unspecified) (Output) - Molecular concentrations (ppm)
* PLUMEF - REAL Array (Dim = NNNMAX X Unspecified) (Output) - Line strength partition function
* PLUMEG - REAL Vector (Len = Unspecified) (Output) - Fine structure partition function
* NNNMAX - INTEGER Variable (Input) - Maximum number of partitions
* IPRINT - INTEGER Variable (Input) - Print index
* KK - INTEGER Variable (Input) - Latitude index
* LL - INTEGER Variable (Input) - Longitude index

PARAMETER Declarations:

INTEGER
MLMAX, NGAS, NASMAX, NL, MAXLAT, MAXLON, NGMAX, NLUPR,
NTEXO, NVSA, ISMX, MOLMAX, MLIDMX, NVSMAX, NAZMAX,
NZSMAX
PARAMETER
(MLMAX=140, NGAS=6, NASMAX=15, NAZMAX=30)
PARAMETER
(NL=50, NLUPR=8, NTEXO=11, NVSMAX=20)
PARAMETER
(MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER
(MAXLAT=3, MAXLON=1, NGMAX=15, NVSA=9)
PARAMETER
(MLIDMX=45, NZSMAX=4)

INTRINSIC and EXTERNAL Declarations:

INTEGER
MDLATM
REAL
XTERP, PARTIT, SATOR, RELHUM
DOUBLE PRECISION
REFRAC
INTRINSIC
MAX, REAL, MIN, ABS, INT
EXTERNAL
XTERP, REFrac, ATMSBD, UPPRBD, PARTIT, BNDMLG,
MOLPBD, SATOR, RELHUM, STMMLD, EXMLBD, MDLATM

Local Variable Declarations:

INTEGER
ITRP1, ITRP2, MLC, I, K, IWATER, MPX, MTX, MCX, IT, M1,
M2, MK
REAL
P0, T0, PS, TS, SATORL, FAC, ZLHL, RHDUM, ABSLAT,
FACLAT, P1, P2, T1, T2, C1, C2

COMMON Blocks:
/ATMDAT/, /CONSTN/, /EXTMOL/, /FLAGS/, /HEADER/,
/MOLCON/, /MOLDAT/, /MOLECNP/, /STDMOL/, /UPRATM/,
/USERDF/, /VSADTA/
SUBROUTINE EQUABS

Argument Declarations:

HXTRA - REAL Vector (Len = Unspecified) (Input) - Extra altitudes in altitude grid
NXTRA - INTEGER Variable (Input) - Dimension of HXTRA
TITLE - CHARACTER(*) Variable (Input) - Title in printout
HEADING - CHARACTER(*) Variable (Input) - Heading in printout

PARAMETER Declarations:

INTEGER
MLMAX, ISMX, NNMAX, NAZMAX, NASMAX, NGAS, MAXLAT,
MAXLON, NGMAX, NZMAX, NL, NVSMAX, NVSA, MOLMAX,
MLIDMX
PARAMETER
(NGMAX=15, NAZMAX=30, NASMAX=15, NZMAX=4)
PARAMETER
(MMAX=140, NNMAX=5, NGAS=6)
PARAMETER
(MMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
PARAMETER
(MAXLAT=3, MAXLON=1, NVSMAX=20, NVSA=9, NL=50)

INTRINSIC and EXTERNAL Declarations:

INTEGER
ISTAER
REAL
STRCN2, XTERP, HAEZ, HEYMS, HLOWT, VISRH
CHARACTER*72
IOERR
INTRINSIC
REAL, MAX, MIN, SQRT, MOD, DBLE
EXTERNAL
AERSOL, EQABS, ISTAER, STCRN2, NXXPAU, CLDRBD, HLOWT,
CHRBD, DEVCBD, HAEZ, MOLPB, XTERP, HEYMS, IOERR,
HYDROM, SETALT, SKYNOI, CLDALT, ATMSBD, CHANGE,
VISRH

Local Variable Declarations:

INTEGER
I, L, M, LM, LP, NLP, ITPAU(MAXLAT, MAXLON),
ISTPAU(MAXLAT, MAXLON), NMSPAU(MAXLAT, MAXLON),
IBNLYR, IOS, KK, LL, NLINE, ITRP0, IPRINT, K, JCLD
REAL
ZP(MMAX), FACSNM, FACICE, WL, XL0(MAXLAT, MAXLON),
DMDF, VISX, DUM, CIRICL(MAXLAT, MAXLON), TAV,
HBLYR, SUHC, VI, VF, ZLP
CCM3 REAL
XLOSCH
CHARACTER*8
CLABRV, MOLSYM(MLIDMX)

COMMON Blocks:

/ATMDAT/, /BCKDAT/, /CHRCNM/, /CLDRN/, /CONSTN/, /DEVC/, /HEADER/, /INITAL/, /MOLCON/, /MOLECP/, /OUTPUT/, /PLMDAT/, /VSADTA/
SUBROUTINE EQUECL

Argument Declarations:

ALPHA - REAL Variable (Input) - Equatorial azimuth (deg)
DELTA - REAL Variable (Input) - Equatorial elevation (deg)
YEAR - REAL Variable (Input) - Julian date (year)
XLMBDA - REAL Variable (Output) - Ecliptic azimuth (deg)
BETA - REAL Variable (Output) - Ecliptic elevation (deg)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SIN,COS,ATAN2,ABS

Local Variable Declarations:

REAL T,EA,CSA,SNA,CSD,SND,CSE,SNE,DUM1,DUM2,DUM3,XL,
     CSL,SNL,B

COMMON Blocks: /CONSTN/

SUBROUTINE ESFITY

Argument Declarations:

OPTDEP - REAL Vector (Len = Unspecified) (Input) - Optical depth due to
         molecular band absorption
ALPHAD - REAL Vector (Len = Unspecified) (Input) - Line width divided by
         the line spacing
NMOLDC - INTEGER Variable (Input) - Number of molecules
EXPBND - REAL Variable (Input) - Optical depth due to exponential terms in
         the band model (i.e., aerosols, hydrometeors, continuum, certain
         molecules)
AFIT - REAL Vector (Len = unspecified) (Output) - Linear coefficients for
       the exponential sum fit
XKFIT - REAL Vector (Len = unspecified) (Output) - Exponential coefficients
       for the exponential sum fit
NFIT - INTEGER Variable (Output) - Number of terms for the exponential sum
       fit

PARAMETER Declarations:

INTEGER ISMX,MOLMAX
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL,DBLE,EXP,SQRT
EXTERNAL LAGRD

Local Variable Declarations:

INTEGER K,M
REAL SUMA,TWGP,AFITM,SUMXK
DOUBLE PRECISION BETA,FM,XLG,WLGEX

COMMON Blocks: /CONSTN/,/LAGUER/,/LWMSO/
REAL FUNCTION EVAPOR

Argument Declarations:

\[ T \quad \text{- REAL Variable - Temperature (K)} \]

PARAMETER Declarations:

\[ \text{INTEGER} \quad \text{NPTS} \]
\[ \text{PARAMETER} \quad \text{(NPTS}=18) \]

INTRINSIC and EXTERNAL Declarations:

\[ \text{REAL} \quad \text{XTERP} \]
\[ \text{EXTERNAL} \quad \text{XTERP} \]

Local Variable Declarations:

\[ \text{INTEGER} \quad \text{ITRP0} \]
\[ \text{REAL} \quad \text{XLATNT}(\text{NPTS}),\text{TEMP}(\text{NPTS}) \]

COMMON Blocks: None

LOGICAL FUNCTION EVEN

Argument Declarations:

\[ I \quad \text{- INTEGER Variable - INTEGER input} \]

Local Variable Declarations:

\[ \text{INTEGER} \quad J \]

COMMON Blocks: None

REAL FUNCTION EXGALS

Argument Declarations:

\[ V \quad \text{- REAL Variable - Wavenumber (cm}^{-1}\text{)} \]
\[ DV \quad \text{- REAL Variable - Wavenumber increment (cm}^{-1}\text{)} \]

PARAMETER Declarations:

\[ \text{INTEGER} \quad \text{NPTS} \]
\[ \text{PARAMETER} \quad \text{(NPTS}=7) \]

INTRINSIC and EXTERNAL Declarations:

\[ \text{REAL} \quad \text{XTERP,PLANCK} \]
\[ \text{EXTERNAL} \quad \text{XTERP,PLANCK} \]

Local Variable Declarations:

\[ \text{INTEGER} \quad \text{ITRP0} \]
\[ \text{REAL} \quad \text{WL}(\text{NPTS}),\text{RADNC}(\text{NPTS}),\text{WL0},\text{WLREF} \]

COMMON Blocks: /CONSTN/

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SUBROUTINE EXOATM

Argument Declarations:

- IXOTMP - INTEGER Variable (Input) - Exospheric temperature index
  IXOTMP = 0 implies the standard exospheric temperature (1000 K)
  IXOTMP = 1 implies a user-specified exospheric temperature
  IXOTMP = 2 implies a calculated exospheric temperature
- TINF - REAL Array (Dim = MATLAT x Unspecified) (Input) - Exospheric temperature (K)
- ISEASN - INTEGER Variable (Input) - Seasonal index
  ISEASN = 1 implies summer
  ISEASN = 2 implies winter
  ISEASN = 3 implies spring/fall
- NLAT - INTEGER Variable (Input) - Number of latitudes
- NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

  INTEGER                   MAXLAT, MAXLON, NLUPR, NTEXO
  PARAMETER                 (MAXLAT=3, MAXLON=1, NLUPR=8, NTEXO=11)

INTRINSIC and EXTERNAL Declarations:

  REAL                      XTERP
  EXTERNAL                  XTERP, UPPRBD

Local Variable Declarations:

  INTEGER                   I, KK, LL, ITRP0

COMMON Blocks:             /UPRATM/
REAL FUNCTION EXOTMP

Argument Declarations:

F - REAL Variable - Instantaneous 10.7-cm solar flux obtained from the National Research Council, Ottawa, Canada (10^{-22} \text{ watts/m}^2/\text{cycles/sec})

FBAR - REAL Variable - Average of F over three 27-day solar rotations (10^{-22} \text{ watts/m}^2/\text{cycles/sec})

AP - REAL Vector (Len = Unspecified) - Geomagnetic planetary index
   An alternate expression is KP (see equation below)
   KP = 0 implies absolutely quiet geomagnetic activity
   KP = 2 implies average quiet geomagnetic activity

ISNSPT - INTEGER Variable - Sunspot index
   ISNSPT = 1 implies a sunspot minimum
   ISNSPT = 2 implies average sunspot activity
   ISNSPT = 3 implies a sunspot maximum

IDAY - INTEGER Variable - Day of the year (1 = January 1)

SOLAZ - REAL Variable - Solar azimuth (South = 0.0) (deg)

SOLEV - REAL Variable - Solar elevation (deg)

XLAT - REAL Variable - Latitude (+ implies North/- implies South) (deg)

INSTRINSIC and EXTERNAL Declarations:

INSTRINSIC REAL, ABS, SIN, COS, TAN, ATAN, EXP

Local Variable Declarations:

INTEGER ISNSPP, IDAYP
REAL A(3), BETA, P, GAM, XLAB, XM, XN, R, T1, X1, X2, X3, AX,
     DUM, HSTAR, ETA, THETA, FP, FBARP

COMMON Blocks: /CONSTN/
SUBROUTINE FIOPN

Argument Declarations:

  * IFINP  - INTEGER Variable (Input) - Input file number
  IFILE  - INTEGER Variable (Input/Output) - File number

INTRINSIC and EXTERNAL Declarations:

  * CHARACTER*4  UPCASE
  CHARACTER*72  IOERR
  EXTERNAL    RDLINE, IOERR, UPCASE

Local Variable Declarations:

  INTEGER        IOS
  CHARACTER*255  NFILE

COMMON Blocks:  None

SUBROUTINE FILRT

Argument Declarations:

  FILERT  - CHARACTER*(*) Variable (Input) - File root
  FILENM  - CHARACTER*(*) Vector (Len = Unspecified) (Input) - File names

PARAMETER Declarations:

  INTEGER        MOLMAX
  PARAMETER     (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

  INTRINSIC    INDEX, LEN
  EXTERNAL    DEVCBD, LCTRIM

Local Variable Declarations:

  INTEGER        I, IXM
  CIBM        CHARACTER*1  SLASH

COMMON Blocks:  /DEVCMN/

165
REAL FUNCTION FILTER

Argument Declarations:

ITYPE - INTEGER Variable - Type of filter response
ITYPE = 0 implies a square response
ITYPE = 1 implies a user-defined response

V - REAL Variable - Wavenumber (cm⁻¹)

VI - REAL Variable - Initial wavenumber for square response (cm⁻¹)

VF - REAL Variable - Final wavenumber for square response (cm⁻¹)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
EXTERNAL XTERP

Local Variable Declarations:

INTEGER ITTP0
REAL WLO

COMMON Blocks: /CONSTN/, /FLTRDT/

SUBROUTINE FLSTAT

Argument Declarations:

FILENAME - CHARACTER(*) Vector (Len = Unspecified) (Input) - File names

ISMARY - INTEGER Variable (Output) - Summary switch
ISMARY = 0 implies full calculations desired
ISMARY = 1 implies a summary of an existing file
ISMARY = 2 implies a restart of a previous calculation

FILXST - LOGICAL Variable (Output) - Existence flag for IFATM
FILXSB - LOGICAL Variable (Output) - Existence flag for IFBCK
FILXSP - LOGICAL Variable (Output) - Existence flag for IFPLM
FILXSM - LOGICAL Variable (Output) - Existence flag for IFMSC
FILXSC - LOGICAL Variable (Output) - Existence flag for IFTRN
FILXSH - LOGICAL Variable (Output) - Existence flag for IFHTR
FILXST - LOGICAL Variable (Output) - Existence flag for IFPT7
FILXSB - LOGICAL Variable (Output) - Existence flag for IFPT8
FILXSD - LOGICAL Variable (Output) - Existence flag for IFDIS

PARAMETER Declarations:

INTEGER MOLMAX
PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*1 UPCODE
CHARACTER*72 IOERR
EXTERNAL DEVCBD, UPCODE, IOERR

Local Variable Declarations:

INTEGER IOS
CHARACTER*1 RESPON, YES

COMMON Blocks: /DEVICE/, /MACHIN/

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SUBROUTINE FLUXIW

Argument Declarations:

T    - REAL Vector (Len = Unspecified) (Input) - Temperatures (K) vs. pressure
LEV   - INTEGER Variable (Input) - Altitude level index
FU    - REAL Variable (Output) - Upward diffuse longwave flux (W/m²) at level LEV
FD    - REAL Variable (Output) - Downward diffuse longwave flux (W/m²) at level LEV
EMRAD - REAL Variable (Input) - Emitted flux from earth (W/m²)
CLDP  - REAL Vector (Len = Unspecified) (Input) - Cloud cover (%)
       1 - Low etage
       2 - Middle etage
       3 - High etage

INTRINSIC and EXTERNAL Declarations:

EXTERNAL    BRNBD

Local Variable Declarations:

REAL       A,B,C,D,E,AP,BP,CP,AT,BT,CT,DT,ET,
           ATP,BTP,CTP,CC,CCH,CCL,CH,CL,CM,
           SIGMA,EMHB,EMHT,EMMB,EMMT,EMLB,EMLT

COMMON Blocks:  /CLDPAR/,/CLIMAT/,/OMATLW/

SUBROUTINE FRESNL

Argument Declarations:

E1    - COMPLEX Variable (Input) - Dielectric constant of layer that electric field starts in
E2    - COMPLEX Variable (Input) - Dielectric constant of layer that electric field ends up
ANGLE - REAL Variable (Input) - Elevation angle in free space (deg)
RH    - COMPLEX Variable (Input) - Horizontally polarized reflectivity
RV    - COMPLEX Variable (Input) - Vertically polarized reflectivity
TH    - COMPLEX Variable (Input) - Horizontally polarized transmissivity
TV    - COMPLEX Variable (Input) - Vertically polarized transmissivity

INTRINSIC and EXTERNAL Declarations:

INTRINSIC    COS,CMPLX,SQRT,ABS

Local Variable Declarations:

COMPLEX     CI,S1,S2

COMMON Blocks:  /CONSTN/

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REAL FUNCTION GALRAD

Argument Declarations:

XL  - REAL Variable - Galactic azimuth (deg)
B   - REAL Variable - Galactic elevation (deg)
V   - REAL Variable - Wavenumber (cm⁻¹)
DV  - REAL Variable - Wavenumber increment (cm⁻¹)

INTRINSIC and EXTERNAL Declarations:

REAL    PLANCK
INTRINSIC ABS, EXP
EXTERNAL PLANCK

Local Variable Declarations:

REAL C(3), C0, T0, AL, PHI

COMMON Blocks: /CONSTN/

REAL FUNCTION GAM

Argument Declarations:

R1S  - REAL Variable - Directional reflection coefficient, layer 1
R2   - REAL Variable - Diffuse reflection coefficient, layer 2
R2S  - REAL Variable - Directional reflection coefficient, layer 2
R3   - REAL Variable - Diffuse reflection coefficient, layer 3
T2   - REAL Variable - Transmission, layer 2

REAL FUNCTION GAMMLN

Argument Declarations:

X    - REAL Variable - Argument

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, DBLE, LOG

Local Variable Declarations:

INTEGER I
DOUBLE PRECISION A(6), STP, PFP, TMP, SUM, DXINC, DX

COMMON Blocks: None
SUBROUTINE GBLCK

Argument Declarations:

XLATIT - REAL Variable (Input) - Latitude (deg)
  implies Northern hemisphere
  - implies Southern hemisphere
XLONG - REAL Variable (Input) - Longitude (deg)
  implies Western hemisphere
  - implies Eastern hemisphere
MONTH - INTEGER Variable (Input) - Month index (1 = Jan)
HOUR - REAL Variable (Input) - Time of day (LST) (dec. hr.)
ISCENE - INTEGER Variable (Output) - Scene index
ALTIT - REAL Variable (Input/Output) - Altitude (km)
TSURF - REAL Variable (Input/Output) - Surface temperature (K)
CLDCVR - REAL Vector (Len = Unspecified) (Output) - Cloud cover (%)
  0 - Total
  1 - Low etage
  2 - Middle etage
  3 - High etage
TMDN - REAL Variable (Output) - Air temperature at midnight (K)
TNOON - REAL Variable (Output) - Air temperature at noon (K)
FRSNW - REAL Variable (Output) - Percentage snow (%)
FREE - REAL Variable (Output) - Percentage ice (%)
FRWTR - REAL Variable (Output) - Percentage water (%)

INTRINSIC and EXTERNAL Declarations:

REAL AIRTMP
INTRINSIC REAL, INT, MAX, MIN, MOD, ABS, SIGN
EXTERNAL AIRTMP, RDGBL, RDSCN, ATMSBD, DEVCBD

Local Variable Declarations:

REAL FAC, GMT(2,2), TSRF(2), CLCV(2,0:3,2), ALT
  CLDRAD(2,3,2), CIRR, HOUR0, TAIR0

COMMON Blocks: None
SUBROUTINE GEOM

Argument Declarations:

L1 - INTEGER Variable (Input) - Indicates location in profile array of initial point of path
L2 - INTEGER Variable (Input/Output) - Indicates location in profile array of final point of path
SLRNG - REAL Variable (Input) - Slant range (km)
BETA - REAL Variable (Input) - Earth center angle (deg)
PHI1 - REAL Variable (Input) - Elevation angle at point L1 (rad)
PHI2 - REAL Variable (Input) - Elevation angle at point L2 (rad)
LENP - INTEGER Variable (Input) - Index for the type of path in case of any ambiguity
LENP = 0 implies shorter path
LENP = 1 implies longer path
ITPGM - INTEGER Variable (Input) - Index for the type of geometry
R - REAL Vector (Len = Unspecified) (Output) - Distances between initial point of path and intermediate points along path (km)
PHI - REAL Vector (Len = Unspecified) (Output) - Elevation angles at intermediate points along path (rad)
THETA - REAL Vector (Len = Unspecified) (Output) - Earth center angles at intermediate points along path (rad)
IZ - INTEGER Vector (Len = Unspecified) (Output) - Location in altitude grid of intermediate points along path
LYR - INTEGER Variable (Output) - DIMENSION of R, PHI, THETA, and IZ
LYRMAX - INTEGER Variable (Input) - Maximum allowed DIMENSION of R, PHI, THETA, and IZ
IBKGD - INTEGER Variable (Input/Output) - Type of background
RHOS - REAL Variable (Input) - Slant range from L1 to tangent point at L2 (km)
BHOS - REAL Variable (Input) - Earth-center angle from L1 to tangent point at L2 (rad)
PHOS - REAL Variable (Input) - Elevation angle at L1 for L2 to be at the tangent point (rad)
SRMAX - REAL Variable (Input) - Maximum slant range between L1 and L2 (km)
BETMAX - REAL Variable (Input) - Maximum earth center angle between L1 and L2 (deg)
IWARN - INTEGER Variable (Input) - Convergence warning printout switch
IWARN = 0 implies no convergence warning message printed
IWARN = 1 implies convergence warning message printed
IERR - INTEGER Variable (Output) - Error switch
IERR = -1 implies fatal errors in geometry
IERR = 0 implies no errors in geometry
IERR = 1 implies warning in geometry
HTNGT - REAL Variable (Input/Output) - Tangent altitude (km)
HSEND - REAL Variable (Input/Output) - End point altitude (km)
NLAT - INTEGER Variable (Input) - Number of latitudes
NLON - INTEGER Variable (Input) - Number of longitudes
FLIMB - LOGICAL Variable (Input) - Logical flag for limb paths

PARAMETER Declarations:

INTEGER MLMAX, ISMX, MAXLAT, MAXLON, NGMAX, MOLMAX
PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MLMAX+8)
PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC ABS, REAL, DBLE, INT, SIGN
EXTERNAL RAYPTH, INIGEO, ENDPFT
SUBROUTINE GEOM (continued)

Local Variable Declarations:

* INTEGER I, J, ITER, LP, MLP, JGBKGD, IDRCT, ISET(2), LLP, JTPGM,
  LENPP, LPP
* REAL VAR(3), FAC(3), EPSR, VAR0, DUM, ALTMAX
* DOUBLE PRECISION PHID, P(3)
* LOGICAL FLVAR, FLPHI1, FLPHI2

COMMON Blocks: /CONSTN/, /INITAL/
SUBROUTINE GETASP

Argument Declarations:

ISHINE - INTEGER Variable (Output) - Sky/earthshine index

PARAMETER Declarations:

INTEGER MLMAX, NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MLMAX=140, NVSMAX=20)
PARAMETER (MAXLAT=3, MAXLON=1, MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTEGER IGTINT
CHARACTER*1 UPCASE
INTRINSIC MAX
EXTERNAL IGTINT, GETVEC, RDLINE, DEVCBD, UPCASE

Local Variable Declarations:

INTEGER NAZDUM, MM
REAL AZDUM(NZSMAX)
CHARACTER*1 ACTION, YES
CHARACTER*255 VARIAB, VARS1, VARS2, VARS3

COMMON Blocks: /DEVICE/, /HEADER/, /USERDF/

SUBROUTINE GETATM

Argument Declarations:

ITYPE - INTEGER Variable (Output) - Latitude index

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTEGER IGTINT, NCHATM, NCHAER, NCHSEA, NCHAZE
REAL GETVAR
CHARACTER*1 UPCASE
CHARACTER*4 LWCASE
INTRINSIC MAX
EXTERNAL GETVAR, DEVCBD, IGTINT, RDLINE, NCHATM, LWCASE, NCHAER, NCHSEA, NCHAZE, UPCASE, IGTVEC, MRNDFL

Local Variable Declarations:

INTEGER K, NMX, KK, LL
REAL ELPST, RADON
CHARACTER*1 ACTION, YES
CHARACTER*255 VARIAB, VARS1, VARS2, VARS3

COMMON Blocks: /DEVICE/, /HEADER/
SUBROUTINE GETECK

Argument Declarations:

HXTRA     - REAL Vector (Len = Unspecified) (Input/Output) - Extra altitude array (km)
NXTRA     - INTEGER Variable (Input/Output) - Number of extra altitudes

PARAMETER Declarations:

 INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, NMA TL, MAXLAT, MAXLON,
             ISMX, NVS MAX, NSCEN, MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (NMA TL=28, NSCEN=35)
PARAMETER (MAXLAT=3, MAXLON=1, NVS MAX=20)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

 INTEGER IGTINT
 REAL GETVAR
 CHARACTER*1 UPCASE
 INTRINSIC MAX
 EXTERNAL RDLINE, GETVAR, IGTINT, DEVCBD, USRBCK, UPCASE,
           GETVEC, BKGDBD

Local Variable Declarations:

 INTEGER L, KK, LL, NCLDCV, NPT3, NMLAB, NMLAT
 REAL DELH
 CHARACTER*255 VARIAB

COMMON Blocks: /BACKGD/, /DEVICE/, /HEADER/
SUBROUTINE GETCLD

Argument Declarations:

HXTRA - REAL Vector (Len = Unspecified) (Output) - Extra altitudes for profile grid (km)
NXTRA - INTEGER Variable (Output) - Number of extra altitudes
HCLDBS - REAL Variable (Output) - Cloud base altitude (km)
DELCLD - REAL Variable (Output) - Cloud thickness (km)

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NNSMAX, MAXLAT, MAXLON, ISMX,
        NVSMAX, MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NNSMAX=4)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTEGER IGTINT
REAL GETVAR
CHARACTER*1 UPCASE
EXTERNAL GETVAR, IGTINT, RDLINE, DEVCBD, USRCLD, UPCASE

Local Variable Declarations:

INTEGER L
REAL CLDBSU, CLDTPU
CHARACTER*1 ACTION, YES
CHARACTER*2 CTYPE
CHARACTER*255 VARIAB, VARS1, VARS2, VARS3, VARS4

COMMON Blocks: /CLDRN/, /DEVICE/, /HEADER/
SUBROUTINE GETEXO

Argument Declarations:

IFINP - INTEGER Variable (Input) - Input file number
F - REAL Variable (Output) - Instantaneous 10.7-cm solar flux obtained from the National Research Council, Ottawa, Canada (10^{-22} watts/m^2/cycles/sec)
FBAR - REAL Variable (Output) - Average of F over three 27-day solar rotations (10^{-22} watts/m^2/cycles/sec)
IXOTMP - INTEGER Variable (Output) - Exospheric temperature index
   IXOTMP = 0 implies the standard exospheric temperature (1000 K)
   IXOTMP = 1 implies a user-specified exospheric temperature
   IXOTMP = 2 implies a calculated exospheric temperature
FLEXO - LOGICAL Variable (Output) - Exoatmospheric temperature calculation flag
AP - REAL Vector (Len = Unspecified) (Output) - Geomagnetic planetary index
   Note: Low value Ap = 3.
   Moderate value Ap = 15.
   High value Ap = 75.
   AP(1): Daily Ap index
   AP(2): 3 hr Ap index for CURRENT TIME
   AP(3): 3 hr Ap index for 3 hrs before current time
   AP(4): 3 hr Ap index for 6 hrs before current time
   AP(5): 3 hr Ap index for 9 hrs before current time
   AP(6): Average of eight 3 hr Ap indices from 12 to 33 hrs prior to current time
   AP(7): Average of eight 3 hr Ap indices from 36 to 59 hrs prior to current time
ISNSPT - INTEGER Variable (Output) - Sunspot index
   ISNSPT = 1 implies a sunspot minimum
   ISNSPT = 2 implies average sunspot activity
   ISNSPT = 3 implies a sunspot maximum
TINFO - REAL Variable (Output) - Specified value of exoatmospheric temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTEGER IGTINT
REAL GETVAR
CHARACTER*1 UPCASE
EXTERNAL GETVAR, DEVCBD, RDLINE, IGTINT, UPCASE, PARSE

Local Variable Declarations:

INTEGER I, NAP
CHARACTER*1 ACTION
CHARACTER*20 VARS(7)
CHARACTER*255 VARIAB, VARS1

COMMON Blocks: None
SUBROUTINE GETGLC

Argument Declarations:

INDX - INTEGER Variable (Input) - Index for number of coefficients
XMU - DOUBLE PRECISION Vector (Len = Unspecified) (Output) - Gauss-Legendre abscissa values
WT - DOUBLE PRECISION Vector (Len = Unspecified) (Output) - Gauss-Legendre weights
N - INTEGER Variable (Output) - Number of coefficients

INTRINSIC and EXTERNAL Declarations:

EXTERNAL GLCFBD

Local Variable Declarations:

INTEGER M,I,IP

COMMON Blocks: /GAUSSL/

SUBROUTINE GETPOS

Argument Declarations:

XLAT - REAL Variable (Output) - Latitude (+ North/- South) (deg)
XLONG - REAL Variable (Output) - Longitude (+ East/- West) (deg)
IDAY - INTEGER Variable (Output) - Day of the month
IMONTH - INTEGER Variable (Output) - Month of the year
IYEAR - INTEGER Variable (Output) - Year
TIME - REAL Variable (Output) - Time (HH.MMSSS)
ITIME - INTEGER Variable (Output) - Time index
    ITIME = 0 implies Local Standard Time
    ITIME = 1 implies Greenwich Mean Time
    ITIME = 2 implies Local Daylight Savings Time
ICOREF - INTEGER Variable (Output) - Coordinate reference index

PARAMETER Declarations:

INTEGER MOLKAX
PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

INTEGER IGTINT,MONTH
REAL GETVAR
CHARACTER*1 LWCASE
CHARACTER*3 UPCASE
INTRINSIC REAL, INT, ABS, MOD, INDEX, LEN
EXTERNAL GETVAR, DEVCBD, IGTINT, RDLINE, MONTH, CALEND, LWCASE, UPCASE, CHTIME

Local Variable Declarations:

INTEGER IHR, IMN, IDAYX, ITYP1, ICH, ICM, LN
REAL XMIN, SEC, YEAR
CHARACTER*255 VARIAB

COMMON Blocks: /DEVICE/
SUBROUTINE GETSLR

Argument Declarations:

- ISOLAR - INTEGER Variable (Output) - Solar index
- ISMPLS - INTEGER Variable (Output) - Type of solar calculation
- SOLEV - REAL Variable (Output) - Solar elevation (deg)
- SOLAZ - REAL Variable (Output) - Solar azimuth (deg)
- SOLDIS - REAL Variable (Output) - Relative solar distance
- XLATSL - REAL Variable (Output) - Sub-solar point latitude (deg)
- XLONSL - REAL Variable (Output) - Sub-solar point longitude (deg)
- ILUNAR - INTEGER Variable (Output) - Lunar index
- ISMPLL - INTEGER Variable (Output) - Type of lunar calculations
- XLUNEV - REAL Variable (Output) - Lunar elevation (deg)
- XLUANZ - REAL Variable (Output) - Lunar azimuth (deg)
- PHILNR - REAL Variable (Output) - Lunar phase (deg)
- XLNDIS - REAL Variable (Output) - Relative lunar distance
- XLATLN - REAL Variable (Output) - Sub-lunar point latitude (deg)
- XLOLN - REAL Variable (Output) - Sub-lunar point longitude (deg)
- ISLANG - INTEGER Variable (Output) - Elevation/zenith angle index
- ISLPOS - INTEGER Variable (Output) - Position index
- IEPHEM - INTEGER Variable (Output) - Ephemeris index
- XLAT - REAL Variable (Input) - Reference latitude (deg)
- XLOA - REAL Variable (Input) - Reference longitude (deg)

PARAMETER Declarations:

- INTEGER MOLMAX
  - (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

- REAL GETVAR
- CHARACTER*1 UPCASE
- INTRINSIC ACOS, COS, ABS, SIGN, ATAN2, TAN, SIN, REAL, DBLE
- EXTERNAL GETVAR, DEVCBD, RDLINE, SPTRIG, UPCASE

Local Variable Declarations:

- INTEGER I
- REAL BETA, XSLR(3), XLNR(3), DOTPR
- DOUBLE PRECISION RSOLAR, RLUNAR, RE
- CHARACTER*2 ACTION
- CHARACTER*255 VARIAB, VARS1, VARS2, VARS3, VARS4, VARS5, VARS6, VARS7

COMMON Blocks:

/CONSTN/, /DEVICE/
REAL FUNCTION GETVAR

Argument Declarations:

  VARIAB - CHARACTER*(*) Variable - Input string

INTRINSIC and EXTERNAL Declarations:

  CHARACTER*72  IOERR
  INTRINSIC      INDEX, LEN
  EXTERNAL      IOERR

Local Variable Declarations:

  INTEGER      ICTN, IOS
  REAL         DEFAULT
  CHARACTER*7  FMTSTR

COMMON Blocks:  None

SUBROUTINE GETVEC

Argument Declarations:

  VARIAB - CHARACTER*(*) Variable (Input) - Input string
  X    - REAL Vector (Len = Unspecified) (Output) - Vector string
  N    - INTEGER Variable (Output) - Length of vector string
  NMAX - INTEGER Variable (Input) - Maximum length of vector string

INTRINSIC and EXTERNAL Declarations:

  INTEGER    LENSTR
  CHARACTER*72  IOERR
  EXTERNAL    IOERR, LENSTR, LCTRIM

Local Variable Declarations:

  INTEGER     I, IM, IP, LNMAX, ISW, IOS
  REAL        DEFAULT
  CHARACTER*7  FMTSTR

COMMON Blocks:  None

178
SUBROUTINE H2OCNT

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm⁻¹)
T - REAL Variable (Input) - Temperature (K)
SH2O - REAL Variable (Output) - Self-broadened coefficient
FH2O - REAL Variable (Output) - Foreign-broadened coefficient

INTRINSIC and EXTERNAL Declarations:

INTRINSIC      MAX, MIN, INT, REAL, TANH, EXP
EXTERNAL       H2OBDB

Local Variable Declarations:

INTEGER       I, N, NP
REAL          SBCOEF(2), XI, FAC, RADCN, FBCOEF, FDG

COMMON Blocks: /CONTNS/

REAL FUNCTION HAZE

Argument Declarations:

H - REAL Variable - Altitude (km)
IHAZE - INTEGER Variable - Index for haze profiles
ISEASON - INTEGER Variable - Index for season
IUPPER - INTEGER Variable - Index for upper atmosphere profile
VIS - REAL Variable - Sea-level visible range (km)
ZVSA - REAL Vector (Len = Unspecified) - Altitude array for vertical structure (km)
ZVSAMX - REAL Variable - Maximum altitude for which vertical structure is valid (km)
HZVSA - REAL Vector (Len = Unspecified) - Extinction coefficients for the vertical structure (km⁻¹)
HBCK - REAL Variable - Altitude of the terrain (km)
HTRO - REAL Variable - Altitude of the tropopause (km)
HSTR - REAL Variable - Altitude of the stratopause (km)

PARAMETER Declarations:

INTEGER       MLMAX, NASMAX, NGMAX, NVSA, NZBNDR, NZTROP,
              NZSTRA, NZUPR, ISMX, MOLMAX
PARAMETER     (MLMAX=140, NASMAX=15, NGMAX=15)
PARAMETER     (NVSA=9, NZBNDR=3, NZTROP=9, NZSTRA=17)
PARAMETER     (NZUPR=14, MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

REAL          XTERP, HLOWT
INTRINSIC     MAX
EXTERNAL      XTERP, HAZEBD, HLOWT

Local Variable Declarations:

INTEGER       ITRP0, I, N, NUPPER, IHZ, ITRP1
REAL          H1, H2, H3, H4, FACV, AHZ1, AHZ2, FACH, HP, HL, HB2, HTRL,
              HSTL

COMMON Blocks: /FLAGS/, /HZDATA/, /USERDF/

179
REAL FUNCTION HEYMS

Argument Declarations:

TEMP  - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC    ABS,EXP,MAX,MIN

Local Variables

REAL      TC

COMMON Blocks: None

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REAL FUNCTION HLOWT

Argument Declarations:

ALT   - REAL Variable - Altitude (km)
HBCK  - REAL Variable - Terrain altitude (km)

Local Variable Declarations:

REAL      HREF

COMMON Blocks: None

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SUBROUTINE HOREQU

Argument Declarations:

AZ      - REAL Variable (Input) - Azimuthal direction (deg)
          North is 0.0 degrees
EL     - REAL Variable (Input) - Elevation angle (deg)
XLATIT - REAL Variable (Input) - Latitude (deg)
TIME   - REAL Variable (Input) - Sidereal time (deg)
ALPHA  - REAL Variable (Output) - Equatorial azimuth (deg)
DELTA  - REAL Variable (Output) - Equatorial elevation (deg)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC    SIN,COS,ATAN2,ABS

Local Variable Declarations:

REAL      CSA,SNA,CSE,SNE,CSL,SNL,DUM1,DUM2,DUM3,T,CST,
          SNT,D

COMMON Blocks: /CONSTN/

180
SUBROUTINE HORIZN

Argument Declarations:

* L1 - INTEGER Variable (Input) - Initial altitude index
L2 - INTEGER Variable (Input) - Final altitude index
LBKGD - INTEGER Variable (Input) - Background altitude index
SLRNG - REAL Variable (Input) - Slant range (km)
BETA - REAL Variable (Input) - Earth center angle (deg)
LENP - INTEGER Variable (Output) - Short/long path index
PHOS - REAL Variable (Output) - Horizon elevation angle (rad)
RHOS - REAL Variable (Output) - Horizon slant range (km)
BHOS - REAL Variable (Output) - Horizon earth center angle (rad)
SRMAX - REAL Variable (Output) - Maximum slant range (km)
BETMAX - REAL Variable (Output) - Maximum earth center angle (deg)
IBKGD - INTEGER Variable (Input) - Background index
IERR - INTEGER Variable (Output) - Error switch
    IERR = -1 implies fatal errors in geometry
    IERR = 0 implies no errors in geometry
IPRINT - INTEGER Variable (Input) - Print switch for warning message
NLAT - INTEGER Variable (Input) - Number of latitudes
NLCN - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER                        MMAX,MMX2
PARAMETER                       (MMAX=140, MMX2=2*MMAX)

INTRINSIC and EXTERNAL Declarations:

EXTERNAL RAYPTh

Local Variable Declarations:

INTEGER                       IOSB(MLMX2), KL, LX, LY, LEN0, JBKGD
REAL                           R(MLMX2), PHI(MLMX2), THETA(MLMX2), RHR, BHR, RHT,
                               BHT, HINGT

DOUBLE PRECISION PHI0

COMMON Blocks: /CONSTN/
SUBROUTINE HTBLNC

Argument Declarations:

RFDSP - REAL Variable (Input) - Direct solar flux at T=0 (W/m²)
RFDS - REAL Variable (Input) - Direct solar flux at T=DELTIM (W/m²)
ABSSLR - REAL Variable (Input) - Solar absorptivity
EMSTR - REAL Variable (Input) - Thermal emissivity
HTC - REAL Vector (Len = 0:Unspecified) (Input) - Conductance
       coefficient (W/m²/K)
CHARL - REAL Variable (Input) - Surface characteristic length (m)
SPHLR - REAL Vector (Len = 0:Unspecified) (Input) - Specific heat
       (W-sec/gm/K)
DENLYR - REAL Vector (Len = 0:Unspecified) (Input) - Density (gm/m³)
DELTIM - REAL Variable (Input) - Time increment (dec. hour)
TAILP - REAL Variable (Input) - Local air temperature at T=0 (K)
TAILC - REAL Variable (Input) - Local air temperature at T=DELTIM (K)
PRESSP - REAL Variable (Input) - Local air pressure at T=0 (mb)
PRESS - REAL Variable (Input) - Local air pressure at T=DELTIM (mb)
WINDTP - REAL Variable (Input) - Wind speed at T=0 (m/sec)
WINDT - REAL Variable (Input) - Wind speed at T=DELTIM (m/sec)
DSWP - REAL Variable (Input) - Downward short-wave flux at T=0 (W/m²)
DSW - REAL Variable (Input) - Downward short-wave flux at T=DELTIM (W/m²)
DLWP - REAL Variable (Input) - Downward long-wave flux at T=0 (W/m²)
DLW - REAL Variable (Input) - Downward long-wave flux at T=DELTIM (W/m²)
TILayer - REAL Vector (Len = 0:Unspecified) (Input/Output) - Temperatures in
           conducting subsurface (K)
ZLAYER - REAL Vector (Len = 0:Unspecified) (Input/Output) - Layer depth (m)
NLAYER - INTEGER Variable (Input) - Number of layers
IHTFLG - INTEGER Variable (Input) - Heat calculation index
        IHTFLG = 0 implies no heat calculations
        IHTFLG = 1 implies heat calculations with evaporation
        IHTFLG = 2 implies heat calculations without evaporation
DUMLYR - REAL Array (Dim = 2 x Unspecified) (Input) - Dummy value
         for each layer moved outside of routine for efficiency
ZSRILR - REAL Variable (Input) - Surface material thickness (m)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, MIN, ABS, EXP
EXTERNAL SRFLUX

Local Variable Declarations:

INTEGER L, NTIME, ITM, NCYCLE, NCYCMX, NTIMIN
REAL FAC, RFDS, TAILT, PRESS, WINDTP, DSWT, DLWT, DELTS,
     B, C, DTIMIN, DTEMP, TEMP(0:21), H, TS, ALPH, PERIOD

COMMON Blocks: /CONSTN/
SUBROUTINE HYDROM

Argument Declarations:

L - INTEGER Variable (Input) - Altitude index
ICLOUD - INTEGER Variable (Input) - Cloud index
ICLDRN - INTEGER Variable (Input) - Cloud and rain index
EXTCLD - REAL Variable (Output) - Extinction coefficient in cloud (km⁻¹)
EXTICE - REAL Variable (Output) - Extinction coefficient for ice clouds (km⁻¹)
ICIRUS - INTEGER Variable (Input) - Cirrus cloud index
HCIRBS - REAL Variable (Input) - Cirrus base altitude (km)
DELCIR - REAL Variable (Input) - Cirrus thickness (km)
CIRICE - REAL Variable (Input) - Cirrus equivalent liquid water content (gm/m²)
EXTCIR - REAL Variable (Input/Output) - Extinction coefficient for cirrus (km⁻¹)
IRAIN - INTEGER Variable (Input) - Rain index
EXTRN - REAL Variable (Output) - Extinction coefficient for rain (km⁻¹)
ISNOW - INTEGER Variable (Input) - Snow type index
EXTSN - REAL Variable (Output) - Extinction coefficient for snow (km⁻¹)
TEMP - REAL Variable (Input) - Temperature (K)
NLAT - INTEGER Variable (Input) - Number of latitudes
NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER MMAX, ISMX, NWLAER, NWLCLD, NANG, MAXLAT, MAXLON,
        NGMAX, MOLMAX
PARAMETER (MMAX=140, MOLMAX=26, ISMX=MOOAX+8)
PARAMETER (NWLAER=47, NWLCLD=79, NANG=65)
PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

REAL RAINEX, SNOWEX, SATUR, XTERP, CIREX
INTRINSIC MIN
EXTERNAL RAINEX, SNOWEX, SATUR, CLDRBD, XTERP, PROFAC, CIREX,
        ARSAAB, ARSBLD, ARSXBD

Local Variable Declarations:

INTEGER I, ICONER, IC, KTPW, KTPFW, KTFI, KTPPI, KK, LL, ITRPO,
        TYPE
REAL FACTW, FACTI

COMMON Blocks: /AEROSL/, AERSCC/, AERSLA/, AERSLX/, CLDRN/
                /CLDUER/, /INITAL/

INTEGER FUNCTION IBKCNV

Argument Declarations:

ISCENE - INTEGER Variable - Ecosystem index

Local Variable Declarations: None

INTRINSIC and EXTERNAL Declarations:

EXTERNAL ECOSBD

COMMON Blocks: /ECOCNV/
INTEGER FUNCTION IBNSRC

Argument Declarations:

X0 - REAL Variable - Value of X for which location is to be found
X - REAL Vector (Len = Unspecified) - X-array (must be monotonic and
either increasing or decreasing)
N - INTEGER Variable - DIMENSION of X-array
KEY - INTEGER Variable - Position in X-array for which search for
    adjacent points to the X0-value starts

INTRINSIC and EXTERNAL Declarations:

    INTRINSIC MAX,MIN,REAL,ABS,INT

Local Variable Declarations:

    INTEGER I,K,M1,M2
    REAL FAC

COMMON Blocks: None

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INTEGER FUNCTION IDAERO

Argument Declarations:

IBKGD - INTEGER Variable - Terrain background index
HBCK - REAL Variable - Terrain altitude (km)

Local Variable Declarations:

    INTEGER IAER(-4:63)

COMMON Blocks: None

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INTEGER FUNCTION IGTINT

Argument Declarations:

VARIAB - CHARACTER(*) Variable - Input string

INTRINSIC and EXTERNAL Declarations:

    CHARACTER*72 IOERR
    INTRINSIC INDEX,LEN
    EXTERNAL IOERR

Local Variable Declarations:

    INTEGER ICNT,IOS,IDFALT
    CHARACTER*5 FMTSTR

COMMON Blocks: None
SUBROUTINE IGTVEC

Argument Declarations:

VARIAB - CHARACTER(*) Variable (Input) - Input string
ISTR   - INTEGER Vector (Len = N) (Output) - Vector string
N      - INTEGER Variable (Output) - Length of vector string
NMAX   - INTEGER Variable (Input) - Maximum length of vector string

INTRINSIC and EXTERNAL Declarations:

INTEGER       LENSTR
CHARACTER*72   IOERR
EXTERNAL       IOERR,LENSTR

Local Variable Declarations:

INTEGER       I,IP,IM,LNMAX,ISW,IOS,IDFALT
CHARACTER*5    FMTSTR

COMMON Blocks: None

COMPLEX FUNCTION INDEXI

Argument Declarations:

WL      - REAL Variable - Wavelength (μm)
TEMP    - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL       XTERP
INTRINSIC   CMPLX
EXTERNAL    XTERP,ICEBD

Local Variable Declarations:

INTEGER    I,ITRPO
REAL        EMW,EMWT(4),CAYW,CAYWT(4)

COMMON Blocks: /ICEREF/

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COMPLEX FUNCTION INDEXW

Argument Declarations:

WL - REAL Variable - Wavelength (µm)
TEMP - REAL Variable - Temperature (K)

PARAMETER Declarations:

INTEGER NWLWTR, NFRQ
PARAMETER (NWLWTR=169, NFRQ=28)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
INTRINSIC CMPLX, SQRT
EXTERNAL XTERP, WTRBD

Local Variable Declarations:

INTEGER ITRPO
REAL EMW, CAYW, DIELR, DIELI, ES, RLS, EW, EINFO, V, FREQ

COMMON Blocks: /INDXWR/

SUBROUTINE INDEXB

Argument Declarations:

IBKGD - INTEGER Variable (Input) - Scene/Background index
MONTH - INTEGER Variable (Input) - Month index (1 = Jan)
HOUR - REAL Variable (Input) - Time of day (LST) (dec. hr.)
XLAT - REAL Variable (Input) - Latitude (deg.)
XLON - REAL Variable (Input) - Longitude (deg.)
TAIR - REAL Variable (Input/Output) - Surface air temperature (K)
CLDCVR - REAL Vector (Len = Unspecified) (Output) - Cloud cover
  0 - Total
  1 - Low etage
  2 - Middle etage
  3 - High etage
ISCENE - INTEGER Variable (Output) - Scene index
TMIDN - REAL Variable (Output) - Air temperature at midnight (K)
TNOON - REAL Variable (Output) - Air temperature at noon (K)
TPROF - REAL Variable (Input) - Profile temperature (K)
FRSNW - REAL Variable (Output) - Percentage snow (%)
FRICE - REAL Variable (Output) - Percentage ice (%)
FRWTR - REAL Variable (Output) - Percentage water (%)

PARAMETER Declarations:

INTEGER NSCEN
PARAMETER (NSCEN=35)

INTRINSIC and EXTERNAL Declarations:

EXTERNAL GBLBCK

Local Variable Declarations:

REAL ALTIT

COMMON Blocks: None

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INTEGER FUNCTION INDXSC

Argument Declarations:

  IScene - INTEGER Variable - Scene/Background index

Local Variable Declarations: None

COMMON Blocks: None

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SUBROUTINE INICPL

Argument Declarations:

  NPTS   - INTEGER Variable (Output) - Number of points in exponential sum fit
  NMOLFC - INTEGER Variable (Input) - Number of molecules

PARAMETER Declarations:

  INTEGER         MLMAX, NBAND, ISMX, NANG, MAXLAT, MAXLON, NMAX,  
                  NAZMAX, NASMAX, NZSMAX, NVSMAX, MOLMAX 
  PARAMETER       (MLMAX=140, NBAND=16, NANG=65)  
  PARAMETER       (MOLMAX=26, ISMX=MOLMAX-8)     
  PARAMETER       (NMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=40) 
  PARAMETER       (MAXLAT=3, MAXLON=1, NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

  REAL            BETA, BETAU
  INTRINSIC       SIN, ABS, MAX, MIN
  EXTERNAL        ESFIT, UDLAY, BETA, BETAU, SRTLAY

Local Variable Declarations:

  INTEGER         I, K, L, LM, LP, KK, LL 
  REAL            OPDPTH(ISMX), OPTI, ALBI, ALPHAD(ISMX), B, BUS, BUL, 
                  DZ, BS, TS, P0, T0, EXPDEP, XMUGS, XMUL, SCTDEP

COMMON Blocks: /ARSLSC/, /CONSTN/, /FLAGS/, /HEADER/, /INITAL/, 
               /LYRSTO/, /MSPARM/, /PRBND/, /PRBNDB/
SUBROUTINE IniGeO

Argument Declarations:

L1 - INTEGER Variable (Input) - Indicates location in profile array of initial point of path
L2 - INTEGER Variable (Input) - Indicates location in profile array of final point of path
SLRNG - REAL Variable (Input) - Slant range (km)
BETA - REAL Variable (Input) - Earth center angle (deg)
PHI1 - REAL Variable (Input) - Elevation angle at point L1 (rad)
PHI2 - REAL Variable (Input) - Elevation angle at point L2 (rad)
LENP - INTEGER Variable (Input) - Index for the type of path in case of any ambiguity
LENP = 0 implies shorter path
LENP = 1 implies longer path
RHOS - REAL Variable (Input) - Slant range from L1 to tangent point at L2 (km)
BHOS - REAL Variable (Input) - Earth-center angle from L1 to tangent point at L2 (rad)
PHOS - REAL Variable (Input) - Elevation angle at L1 for L2 to be at the tangent point (rad)
SRMAX - REAL Variable (Input) - Maximum slant range between L1 and L2 (km)
BETMAX - REAL Variable (Input) - Maximum earth center angle between L1 and L2 (deg)
P - DOUBLE PRECISION Vector (Len = Unspecified) (Output) - Source elevation angles for ray path. Three values correspond to an upper limit, a lower limit, and the best estimate value (rad)
VAR - REAL Vector (Len = Unspecified) (Output) - Either slant or earth center angle or source elevation angle corresponding to the three values of P (km or deg or rad)
VAR0 - REAL Variable (Output) - Either slant or earth center angle corresponding to the input value (km or deg)
JTPGM - INTEGER Variable (Input) - Index for type of geometry
JTPGM = 1 implies the slant range is defined
JTPGM = 2 implies the earth center angle is defined
JTPGM = 3 implies the source elevation angle is defined
JTPGM = 4 implies the observer elevation angle is defined
IERR - INTEGER Variable (Output) - Error switch
IERR = -1 implies fatal errors in geometry
IERR = 0 implies no errors in geometry
IERR = 1 implies warning in geometry

PARAMETER Declarations:

INTEGER
MLMAX, ISMX, MAXLAT, MAXLON, NMAX, NA2MAX, NASMAX, NZSMAX, NVMAX, MOLMAX

PARAMETER
(MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)

PARAMETER
(NMAX=15, NA2MAX=30, NASMAX=15, NZSMAX=4)

PARAMETER
(MAXLAT=3, MAXLON=1, NVMAX=20)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC
COS, SIN, ACOS, ASIN, ABS, ATAN2, MAX, MIN, DBLE, REAL, SIGN

Local Variable Declarations:

INTEGER
KK, LL

REAL
DEH, VAR0, G, RH1, RH2, FAC(3), XMHAV1, XMHAV2, XMHAVB, ATMPAC(MAXLAT, MAXLON)

DOUBLE PRECISION
R1, R2, DR2, XR, MHP1, MHPB, PMIN, PMAX

COMMON Blocks: /CONSTN/, /HEADER/, /INITAL/
SUBROUTINE INITI

Argument Declarations:

LENP - INTEGER Vector (Len = Unspecified) (Output) - Index for short or long path. Only needed when an ambiguity exists.
ISHINE - INTEGER Vector (Len = Unspecified) (Output) - Sky/earthshine index
HXTRA - REAL Vector (Len = Unspecified) (Output) - Extra altitudes for profile grid (km)
NXTRA - INTEGER Variable (Output) - Number of extra altitudes
NXMAX - INTEGER Variable (Input) - Dimension of HXTRA
HEADNG - CHARACTER*(*) Variable (Output) - User-defined heading
FILERT - CHARACTER*(*) Variable (Input) - File root
IFLTR - INTEGER Variable (Input) - Filter index
ISMARY - INTEGER Variable (Output) - Summary index
ISLPOS - INTEGER Variable (Output) - Solar/lunar position index

PARAMETER Declarations:

INTEGER MLMAX, ISMX, NAZMAX, NASMAX, NGMAX, NZSMAX, NANTMX, MAXLAT, MAXLON, NL, NMATL, NVSMAX, NVSA, MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8, NVSA=9)
PARAMETER (NANTMX=25)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (NL=50)
PARAMETER (NMATL=28)

INTRINSIC and EXTERNAL Declarations:

INTEGER MDLATM
REAL GETVAR, EXOTMP
CHARACTER*1 UPACA
CHARACTER*3 LWCAS
CHARACTER*72 IOERR
INTRINSIC MIN, REAL, SIGN, ATN2, ACOS, COS, SIN, TAN, MOD, AINT, ABS, MAX, INT
EXTERNAL DFLT8, GETVAR, GETVEC, SETFLG, ISRAEL, DEVCBD, VSA, GETSLR, RDLINE, GETATM, GETCLD, GETBCK, MDLATM, CALEND, USRDEP, GETPOS, PARSE, INPTBD, BEAUTF, BINFL, MIEINP, DEFAUL, EXOAAM, STGEOM, CIRRUS, ZROHR, UPACA, LWCAS, IOERR, GBLBCK, GETASP, DFLT2, FILOPN, FILRT, ATMSBD, BKGDDB, GETEXO, EXOTMP

Local Variable Declarations:

INTEGER I, K, L, M, ITYPE, NVAR, IDAYX, NXTRAP, IOS, ISUB, ISWINP(17), IXOTMP, KK, LL, NTX, IZERO, ITPY0, ISCENE, JSHINE, NXTRP, IT, M1, M2
CEXO INTEGER KP, ISNSPT
REAL HCLDBS, DELCLD, DYEAR, TINF0, TDUM(2), TMDTN, TNOON,- FRSNWP, PRICEP, TAIKP, CLDCTP(0:3), HBK, WIND0, TAIRO,- ABSLAT, PAILAT, FRWTRP

CEXO REAL F, FRVAR
CEXO LOGICAL PLEXO
CHARACTER*1 DOT
CHARACTER*20 VRDATA(14)
CHARACTER*50 VARSUB
CHARACTER*80 DUMMY, FILENM(17)
CHARACTER*255 VARIAB

COMMON Blocks:
/ANTECD/, /ATMDAT/, /BACKGD/, /CONSTN/, /DEVICE/, /FLAGS/, /HEADER/, /INITIAL/, /INPTBD/, /OUTPUT/, /VSADTH/
SUBROUTINE INTEG

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm⁻¹)
FLTR - REAL Variable (Input) - Filter weighting factor
BW - REAL Variable (Input/Output) - Band width (cm⁻¹)
BWL - REAL Variable (Input/Output) - Band width (µm)
NAZ - INTEGER Variable (Input) - Number of observer/source azimuths
NASPCT - INTEGER Variable (Input) - Number of earth/skyshine elevation angles
NAZSH - INTEGER Variable (Input) - Number of earth/skyshine azimuth angles
NSRCE - INTEGER Variable (Input) - Location of source in ray
NBKGD - INTEGER Variable (Input) - Location of background in ray
BKSUMV - REAL Array (Dim = 6 x NMATL x Unspecified) (Input/Output) -
  Spectral background radiance for each material (W/cm²/sr/cm⁻¹)
SIGMEP - REAL Array (Dim = NAZMAX x Unspecified) (Input/Output) -
  Scintillation along path
TAUSCP - REAL Array (Dim = NAZMAX x Unspecified) (Input/Output) -
  In-scattered transmittance along path
RADSLP - REAL Array (Dim = NAZMAX x Unspecified) (Input/Output) -
  Solar irradiance along path (W/cm²/cm⁻¹)
RADLNP - REAL Array (Dim = NAZMAX x Unspecified) (Input/Output) -
  Lunar irradiance along path (W/cm²/cm⁻¹)
RADPHT - REAL Array (Dim = NAZMAX x MLMX2 x Unspecified)
  (Input/Output) - Emitted path radiance along path (W/cm²/sr/cm⁻¹)
DRADP - REAL Array (Dim = NAZMAX x Unspecified) (Input/Output) -
  Emitted path radiance along path (W/cm²/sr/cm⁻¹)
RDSLSP - REAL Array (Dim = NAZMAX x MLMX2 x Unspecified)
  (Input/Output) - Scattered radiance along path (W/cm²/sr/cm⁻¹)
TAUULR - REAL Array (Dim = NAZMAX x Unspecified) (Input/Output) -
  Transmittance along path
IGEOM - INTEGER Variable (Input) - Geometry index

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, MLMAX, MLMX2, NZSMAX, NMATL,
  MAXLAT, MAXLON, NGMAX
PARAMETER (NAZMAX=30, NASMAX=15, NZSMAX=4, NGMAX=15)
PARAMETER (MLMAX=140, MLMX2=2*MMLAX)
PARAMETER (NMATL=28, MAXLAT=3, MAXLON=1)

Local Variable Declarations:

INTEGER K, M, MM, LB
REAL DBW

COMMON Blocks: /BCKDAT/, /INTSTO/
SUBROUTINE INTR2D

Argument Declarations:

X0 - REAL Variable (Input) - X-component of point to be evaluated
Y0 - REAL Variable (Input) - Y-component of point to be evaluated
X - REAL Vector (Len = Unspecified) (Input) - X-component of grid
NX - INTEGER Variable (Input) - Number of X grid points
NXMAX - INTEGER Variable (Input) - Maximum number of X grid points
Y - REAL Vector (Len = Unspecified) (Input) - Y-component of grid
NY - INTEGER Variable (Input) - Number of Y grid points
FAC - REAL Array (Dim = NXMAX x Unspecified) (Output) - Interpolation weights

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, MIN, ABS

Local Variable Declarations:

INTEGER I, J, IX, IXP, IY, IYP
REAL FX, FY

COMMON Blocks: None

CHARACTER*72 FUNCTION IOERR

Argument Declarations:

IOS - INTEGER Variable - Value returned by IOSTAT

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 GERROR
CLAH EXTERNAL IOSTAT_MSG
EXTERNAL GERROR

Local Variable Declarations:

CVAX CHARACTER*48 CHERRY(68)
CLAH CHARACTER*152 MESSAG
CIBM INTEGER*2 I2(2)
CIBM INTEGER I

COMMON Blocks: None

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SUBROUTINE ISRAEL

Argument Declarations:

ISMX - INTEGER Variable (Input) - First DIMENSION of MC
MA - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) - Model atmosphere index
MP - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) - Pressure profile index
MT - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) - Temperature profile index
MC - INTEGER Array (Dim = ISMX x MAXLAT x Unspecified) (Input/Output) - Molecular concentrations profile index
NLAT - INTEGER Variable (Input) - Number of latitudes
NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER NGMAX, MAXLAT
PARAMETER (NGMAX=15, MAXLAT=3)

Local Variable Declarations:

INTEGER K, KK, LL

COMMON Blocks: /FLAGS/

INTEGER FUNCTION ISTAER

Argument Declarations:

IAERO1 - INTEGER Variable - Boundary layer aerosol type
IAERO2 - INTEGER Variable - Stratospheric aerosol type
ITRPAU - INTEGER Variable - Tropopause index
   ITRPAU = 0 implies that Z is below the tropopause
   ITRPAU = 1 implies that Z is above the tropopause
ISTPAU - INTEGER Variable - Stratopause index
   ISTPAU = 0 implies that Z is below the stratopause
   ISTPAU = 1 implies that Z is above the stratopause
Z - REAL Variable - Altitude (km)
HB - REAL Variable - Terrain altitude (km)
IHAZE - INTEGER Variable - Haze profile index

PARAMETER Declarations:

INTEGER MMAX, NASMAX, ISMX, MOLMAX
PARAMETER (MMAX=140, NASMAX=15)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

REAL HLOWT
EXTERNAL HLOWT

Local Variable Declarations:

INTEGER L, ILYR

COMMON Blocks: /USERDF/
SUBROUTINE KDISTR

Argument Declarations: None

PARAMETER Declarations:

\[
\begin{align*}
\text{INTEGER} & \quad \text{NAZMAX, MLMAX, ISMX, MAXLAT, MAXLON, NGMAX, NASMAX,} \\
& \quad \text{NWSMAX, MOLMAX, MLIDMX} \\
\text{PARAMETER} & \quad (\text{NGMAX}=15, \text{NAZMAX}=30, \text{NASMAX}=15, \text{NWSMAX}=4) \\
\text{PARAMETER} & \quad (\text{MLMAX}=140, \text{MOLMAX}=26, \text{ISMX}=\text{MOLMAX}+8) \\
\text{PARAMETER} & \quad (\text{MAXLAT}=3, \text{MAXLON}=1, \text{NWSMAX}=20, \text{MLIDMX}=45)
\end{align*}
\]

Local Variable Declarations:

\[
\begin{align*}
\text{INTEGER} & \quad J, L, KK, LL \\
\text{REAL} & \quad \text{SCATM, EXTNCM}
\end{align*}
\]

COMMON Blocks: 
\[
/\text{BKCDAT/}, /\text{HEADER/}, /\text{KDISDT/}, /\text{MOLECP/}, /\text{PRENDA/}, \\
/\text{PRBNDB/}
\]

SUBROUTINE LAYLN

Argument Declarations:

\[
X \quad \text{- REAL Array (Dim = 10 x Unspecified) (Input/Output) -} \\
\text{Optical path or path-weighted temperature matrix}
\]

Local Variable Declarations:

\[
\begin{align*}
\text{INTEGER} & \quad I, J
\end{align*}
\]

COMMON Blocks: None

SUBROUTINE LCTRIM

Argument Declarations:

\[
\text{CHRSTR} \quad \text{- CHARACTER*(*) Variable (Input/Output) - CHARACTER String}
\]

INTRINSIC and EXTERNAL Declarations:

\[
\begin{align*}
\text{INTRINSIC} & \quad \text{LEN}
\end{align*}
\]

Local Variable Declarations:

\[
\begin{align*}
\text{INTEGER} & \quad I, K, ISTART, IMAXLN
\end{align*}
\]

COMMON Blocks: None

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INTEGER FUNCTION LENSTR

Argument Declarations:

CHRSTR - CHARACTER(*) Variable - Input CHARACTER string

INTRINSIC and EXTERNAL Declarations:

INTRINSIC LEN

Local Variable Declarations:

INTEGER I, IMXLEN

COMMON Blocks: None

CHARACTER(*) FUNCTION LWCASE

Argument Declarations:

STRING - CHARACTER(*) Variable - Input string

INTRINSIC and EXTERNAL Declarations:

INTRINSIC LEN, INDEX

Local Variable Declarations:

INTEGER I, LOC
CHARACTER*26 UPPER, LOWER

COMMON Blocks: None

SUBROUTINE LYRINT

Argument Declarations:

TSRF - REAL Variable (Input) - Initial surface temperature (K)
TLAYER - REAL Vector (Len = 0:Unspecified) (Input/Output) - Temperatures in conducting subsurface (K)
TSSL - REAL Variable (Input) - Initial sub-surface temperature (K)
ZLAYER - REAL Vector (Len = 0:Unspecified) (Input/Output) - Layer depth (m)
NLAYER - INTEGER Variable (Input) - Number of layers
SPHEAT - REAL Vector (Len = Unspecified) (Input) - Specific heat (W-sec/gm/K)
DENSTY - REAL Vector (Len = Unspecified) (Input) - Density (gm/m³)
HTCOND - REAL Vector (Len = Unspecified) (Input) - Conductance coefficient (W/m²/K)
ZHLYR - REAL Vector (Len = Unspecified) (Input) - Material layer

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SQRT, EXP, REAL, COS

Local Variable Declarations:

INTEGER L, LS
REAL DAMPD, PERIOD, DZ

COMMON Blocks: /CONSTN/

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SUBROUTINE MARINE

Argument Declarations:

  VIS - REAL Variable (Output) - Meteorological range (km)
  WIND - REAL Variable (Input) - Current wind speed (m/sec)
  WHR - REAL Variable (Input) - 24-hour average wind speed (m/sec)
  ICSTL - INTEGER Variable (Input) - Air mass character index
           ICSTL = 1 implies open ocean
           ICSTL = 10 implies strong continental influence
           Values in between represent varying degrees of continental influence.
  BEXT - REAL Vector (Len = Unspecified) (Output) - Extinction coefficient (km⁻¹)
  BABS - REAL Vector (Len = Unspecified) (Output) - Absorption coefficient (km⁻¹)
  RH - REAL Variable (Input) - Relative humidity

PARAMETER Declarations:

  INTEGER         NWLAER, NWLCLD, NANG
  PARAMETER       (NWLAER=47, NWLCLD=79, NANG=65)

INTRINSIC and EXTERNAL Declarations:

  INTRINSIC       REAL, MAX, MIN
  EXTERNAL        MARNBD, PROFAC, ARSABD, ARSLBD, ARSXBD

Local Variable Declarations:

  INTEGER         I, J, K, JRH, JRHP
  REAL            A(3), PISC, WS, WH, FAC, TOTAL, QE, EXT55, C, TXV, TAV, F, RHX

COMMON Blocks:  /AEROSL/, /AERSLA/, /AERSLX/, /CONSTN/, /NAVMAR/


FUNCTION MDLATM

Argument Declarations:

  ITYPE - INTEGER Variable - Latitude index
  ISEASN - INTEGER Variable - Season index

Local Variable Declarations:

  INTEGER         LATIT, KSEASN

COMMON Blocks:  None
SUBROUTINE MIE

Argument Declarations:

RADIUS - REAL Variable (Input) - Particle radius (μm)
WL - REAL Variable (Input) - Wavelength (μm)
XNP - COMPLEX Variable (Input) - Complex index of refraction
RNB - COMPLEX Variable (Input) - Complex index of refraction of the medium
NSANGL - INTEGER Variable (Input) - Number of scattering angles
QABSP - REAL Variable (Output) - Absorption coefficient (km⁻¹ per (particles cm³))
QSCAT - REAL Variable (Output) - Absorption coefficient (km⁻¹ per (particles cm³))
GQSCAT - REAL Variable (Output) - Asymmetry coefficient times QSCAT

PARAMETER Declarations:

C**** For extremely large particles, NMAX may have to be increased.
   If Error No. 86 is encountered, then increase NMAX accordingly.

INTEGER NXMIE, NMAX
PARAMETER (NXMIE=101, NMAX=20000)

INTRINSIC and EXTERNAL Declarations:

INTEGER NCYCLE
INTRINSIC CMPLX, INT, REAL, DBLE, ABS, MAX, CONJG, COS, SIN
EXTERNAL NCYCLE

Local Variable Declarations:

INTEGER J, N, NMX, NSTOP, N1, N2, M1, M2, M3, NS2, JJ
REAL CHI(3), FN, TAU1, P, T, X, DUM, QEXT
DOUBLE PRECISION PSI(3)
COMPLEX D(NMAX), Y, XI(3), AN(2), BN(2), REFREL

COMMON Blocks: /CONSTN/, /MIECOT/
SUBROUTINE MIEINP

Argument Declarations:

* IMATRL - INTEGER Variable (Input) - Material index

PARAMETER Declarations:

* INTEGER NWLMX, MOLMAX
  PARAMETER (NWLMX=100, MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

INTEGR REAL CHARACTER*1 CHARACTER*3 CHARACTER*72 INTRINSIC EXTERNAL
IGINT GETVAR UPCASE LWCASE IOERR CMPLX GETVAR, IGTINT, GETVEC, RDLINE, PARSE, UPCASE, LWCASE, IOERR, DEVCBD

Local Variable Declarations:

INTEGER I, J, N, IOS, NVAR, ICOL0, ICOL40, NVAR8, NVAR1, NVAR2, NVAR3, NVAR50
REAL DUM(4), XNR(3), XNI(3)
CHARACTER*1 DOT, MTYPE(3)
CHARACTER*20 VDATA(8)
CHARACTER*80 TITLE, DUMMY
CHARACTER*255 VARIAB

COMMON Blocks: /DEVICE/, /MATERL/
SUBROUTINE MIEPHS

Argument Declarations:

WL - REAL Variable (Input) - Wavelength (μm)
QABSP - REAL Variable (Output) - Absorption coefficient (km⁻¹ per (particles cm⁻³))
QSCAT - REAL Variable (Output) - Absorption coefficient (km⁻¹ per (particles cm⁻³))
G - REAL Variable (Output) - Asymmetry coefficient
THETA - REAL Vector (Len = Unspecified) (Input) - Scattering angles (deg)
PHASE - REAL Array (Dim = 4 x Unspecified) (Output) - Phase function
NANG - INTEGER Variable (Input) - Number of scattering angles
TEMP - REAL Variable (Input) - Temperature (K)
IMATRL - INTEGER Variable (Input) - Particle index

PARAMETER Declarations:

INTEGER NXMIE
PARAMETER (NXMIE=101)

INTRINSIC and EXTERNAL Declarations:

REAL DNDR
COMPLEX INDEXI, INDEXW, EMTREF
INTRINSIC CMPLX, REAL, COS, LOG10, MAX, MIN, ABS, DPROD, AIMAG
EXTERNAL DNDR, COAT, PROFAC, INDEXI, INDEXW, EMTREF, MIE

Local Variable Declarations:

INTEGER I, J, K, KEY, KEYP, ISWTCH(5), NINCL1
REAL RADCOR, QABSI, QSCATI, GI, AREA, SUM, CHKA, DELR, RADN,
     RADN, WT, DRL, FAC, PCTP(5), X
COMPLEX RNB, XNJ(3), XNP(2)

COMMON Blocks: /CONSTN/, /MATERL/, /MIECOT/
SUBROUTINE MLSCAT

Argument Declarations:

L - INTEGER Variable (Input) - Altitude index
RTH - REAL Variable (Output) - Scattered thermal radiance (W/sr/cm²/cm⁻¹)
RSL - REAL Variable (Output) - Scattered solar radiance (W/sr/cm²/cm⁻¹)
TAU - DOUBLE PRECISION Variable (Input) - Transmittance
DRKM - REAL Variable (Input) - Incremental path lengths along raypath (km)
PHI - REAL Variable (Input) - Elevation angle (deg)
I2L - INTEGER Variable (Input) - Altitude layer index
P2HFAC = REAL Array (Dim = MAXLAT x Unspecified) - Proportionality factor for multiple atmospheres
N2PTH - INTEGER Array (Dim = 2 x Unspecified) (Input) - Limits for non-zero elements of P2HFAC

PARAMETER Declarations:

| INTEGER     | MLMAX, NBAND, NANG, MAXLAT, MAXON |
| PARAMETER   | (MLMAX=140, NBAND=16, NANG=65) |
| PARAMETER   | (MAXLAT=3, MAXLON=1) |

INTRINSIC and EXTERNAL Declarations:

REAL         RADTRY, BETAU
INTRINSIC    ABS, SIN, DPON, DBLE
EXTERNAL      BETAU, RADTRY

Local Variable Declarations:

INTEGER      KK, LL
REAL         XMU, BU, FU, SCTOT, ASYMT, HMT(2), HPT(2)
DOUBLE       PRECISION DELTAU, SCT1, SCT2, SCT3, SCT4, DDRKM, DUM, TAUP

COMMON Blocks: /ARSLSC//CONSTN//LYRSTO/

SUBROUTINE MODBCK

Argument Declarations:

FRACT - REAL Vector (Len = Unspecified) (Input/Output) - Fraction of scene materials
INDEXB = INTEGER Vector (Len = Unspecified) (Input/Output) - Index of scene materials
KMATL = INTEGER Variable (Input/Output) - Number of materials in scene
SNOW = REAL Variable (Input) - Percent of scene that is snow (%)
ICE = REAL Variable (Input) - Percent of scene that is ice (%)  
WATER = REAL Variable (Input) - Percent of scene that is water (%) 
TEMP = REAL Variable (Input) - Air temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, MIN

Local Variable Declarations:

INTEGER      K, IS, IX(12)
REAL         SNW, FX(12), FRDUM, XICE, XWWTR

COMMON Blocks: None

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INTEGER FUNCTION MONTH

Argument Declarations:

    CHVAR   - CHARACTER(*) Variable - Month identifier

INTRINSIC and EXTERNAL Declarations:

    CHARACTER*3       UPCASE
    EXTERNAL          LCTRIM,UPCASE

Local Variable Declarations:

    INTEGER           I,J
    CHARACTER*3       CHKNTH(12,2),CHVARP

COMMON Blocks:   None

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PROGRAM MOSART

PARAMETER Declarations:

    INTEGER   NGMAX, NXMAX, NAZMAX, NASMAX, MAXLAT, MAXLON, NVSMAX,
               ISMX, MMLAX, NZSMAX, MOLMAX
    PARAMETER (NGMAX=15, NA2MAX=30, NASMAX=15, NZSMAX=4)
    PARAMETER (MMLAX=140, NXXMAX=100)
    PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
    PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

    REAL            SLPOS
    CHARACTER*72    IOERR
    EXTERNAL        CNSTNT, DEVCBD, TITLCR, EQUABS, INITL, CALCUL, SLPOS,
                     RDFLTR, DBINIT, EPHEMS, CONFIG, PROMPT, IOERR

Local Variable Declarations:

    INTEGER         LENP(NGMAX), ISMARY, ISHINE(NGMAX), NXTRA, IFLTR,
                     IOS, ISLPOS
    REAL            HXTRA(NXMAX)
    CHARACTER*24   TFLTR
    CHARACTER*40   HEADING, FILERT
    CHARACTER*80   TITLE

COMMON Blocks:   /DEVICE/,/FLAGS/,/HEADER/,/INITIAL/
SUBROUTINE MRNDFL

Argument Declarations:

* ICSTL - INTEGER Variable (Input/Output) - Air mass character index
  ICSTL = 1 implies open ocean
  ICSTL = 10 implies strong continental influence
  Values in between represent varying degrees of continental influence
* ELPST - REAL Variable (Input) - Elapsed time since air parcel left land
  (days)
* RADON - REAL Variable (Input) - Current radon 222 concentration (pCi/m³)

INTRINSIC and EXTERNAL Declarations:

  INTRINSIC         INT,EXP

INTEGER FUNCTION NCHAER

Argument Declarations:

  CHVAR - CHARACTER(*) Variable - Aerosol model identifier

INTRINSIC and EXTERNAL Declarations:

  CHARACTER*5      UPCASE
  EXTERNAL         LCTRIM,UPCASE

Local Variable Declarations:

  INTEGER          I,J
  CHARACTER*5      CHAER(0:20,2),CHVARP

COMMON Blocks: None

INTEGER FUNCTION NCHATM

Argument Declarations:

  CHVAR - CHARACTER(*) Variable - Model atmosphere identifier

INTRINSIC and EXTERNAL Declarations:

  CHARACTER*6      UPCASE
  EXTERNAL         LCTRIM,UPCASE

Local Variable Declarations:

  INTEGER          I,J
  CHARACTER*6      CHATM(0:11,2),CHVARP

COMMON Blocks: None
INTEGER FUNCTION NCHAZE

Argument Declarations:

CHVAR - CHARACTER*(*) Variable - Season identifier

INTRINSIC and EXTERNAL Declarations:

CHARACTER*6     UPCASE
EXTERNAL          LCTRIM,UPCASE

Local Variable Declarations:

INTEGER        I,J
CHARACTER*6    CHAZE(-1:10,2),CHVARP

COMMON Blocks: None

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INTEGER FUNCTION NCHSEA

Argument Declarations:

CHVAR - CHARACTER*(*) Variable - Season identifier

INTRINSIC and EXTERNAL Declarations:

CHARACTER*6     UPCASE
EXTERNAL          LCTRIM,UPCASE

Local Variable Declarations:

INTEGER        I,J
CHARACTER*6    CHSEA(0:11,2),CHVARP

COMMON Blocks: None

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INTEGER FUNCTION NCYCLE

Argument Declarations:

N      - INTEGER Variable - Argument
NMOD   - INTEGER Variable - Modulus

INTRINSIC and EXTERNAL Declarations:

INTRINSIC      MOD

Local Variable Declarations:

INTEGER        M

COMMON Blocks: None
SUBROUTINE NXXPAU

Argument Declarations:

ZL - REAL Vector (Len = Unspecified) (Input) - Altitudes (km)
PL - REAL Vector (Len = Unspecified) (Input) - Pressure profile (mb)
TL - REAL Vector (Len = Unspecified) (Input) - Temperature profile (K) nxx
ML - INTEGER Variable (Input) - Number of altitude/temperature/pressure values
NTRPAU - INTEGER Variable (Output) - Location of tropopause
NSTPAU - INTEGER Variable (Output) - Location of stratopause
NMSPA - INTEGER Variable (Output) - Location of mesopause

INTRINSIC and EXTERNAL Declarations:

INTEGER IBNSRC
REAL XTERP
INTRINSIC MIN
EXTERNAL XTERP, IBNSRC, PROFAC

Local Variable Declarations:

INTEGER L, MLM, LP, LPP, LX, LCHECK, KEY, ITRP0
REAL DZ, DT, DTDZ, Z1, Z2, T1, T2, DTDZAV, DZX, DTDZX, TMAX, FAC

COMMON Blocks: None

REAL FUNCTION O2CNT

Argument Declarations:

V - REAL Variable - Wavenumber (cm⁻¹)
TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC INT, REAL, MIN, EXP
EXTERNAL OZCBD

Local Variable Declarations:

INTEGER I, IP
REAL TD, FAC, VX, O2C1, O2C2

COMMON Blocks: /O2C/

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SUBROUTINE OPATH

Argument Declarations:

T   - REAL Vector (Len = Unspecified) (Input) - Temperature (K)
P   - REAL Vector (Len = Unspecified) (Input) - Pressure (mb)
ZP  - REAL Vector (Len = Unspecified) (Input) - Altitude (m)
UP  - REAL Vector (Len = Unspecified) (Input) - H2O density (PS*TS*ppmv)
VP  - REAL Vector (Len = Unspecified) (Input) - CO2 density (PS*TS*ppmv)
WP  - REAL Vector (Len = Unspecified) (Input) - O3 density (PS*TS*ppmv)
ARSLAS - REAL Vector (Len = Unspecified) (Input) - Aerosol absorption in the solar region (km^-1)
ARSLSS - REAL Vector (Len = Unspecified) (Input) - Aerosol scattering in the solar region (km^-1)
ARSLAT - REAL Vector (Len = Unspecified) (Input) - Aerosol absorption in the thermal region (km^-1)
ARSLST - REAL Vector (Len = Unspecified) (Input) - Aerosol scattering in the thermal region (km^-1)
CLDP - REAL Vector (Len = Unspecified) (Input) - Cloud cover (%)
1 - Low etage
2 - Middle etage
3 - High etage

INTRINSIC and EXTERNAL Declarations:

REAL     SATUR
INTRINSIC MAX,MIN
EXTERNAL  SATUR, LAYLW, TRANLW

Local Variable Declarations:

INTEGER   I, J, K, JN, JP, IYPE
REAL       CU, CV, CW, CX(2), CY, CZ(2), CTU, CTV, CTW, CTX, DQ1, DQ2, DQ3, DZ, UNORM, VNORM, WNORM, XNORM, YNORM, ZNORM, P0, T0, DENS

COMMON Blocks: /CLIMAT/, /OMATLW/

SUBROUTINE OPNSCR

Argument Declarations:

IFSCR - INTEGER Variable (Input/Output) - Scratch file device number
LABEL - CHARACTER(*) Variable (Input) - File label

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL IOERR

Local Variable Declarations:

INTEGER I, IOS

COMMON Blocks: None
SUBROUTINE PARSE

Argument Declarations:

VARIN - CHARACTER(*) Variable (Input) - Input string
VAROUT - CHARACTER(*) Vector (Output) (Len = Unspecified) - Vector output string
N    - INTEGER Variable (Output) - Length of vector string
NMAX - INTEGER Variable (Input) - Maximum length of vector string

INTRINSIC and EXTERNAL Declarations:

INTEGER     LENSTR
INTRINSIC    LEN,MIN
EXTERNAL     LCTRIM,LENSTR

Local Variable Declarations:

INTEGER     I,IM,IP,LINMAX,LOUTMX,ISW

COMMON Blocks:  None
REAL FUNCTION PARTIT

Argument Declarations:

TEMPE  - REAL Variable - Temperature (K)
MOLEC  - INTEGER Variable - Molecular index

MOLEC = 1 implies Water vapor (H2O)
MOLEC = 2 implies Carbon dioxide (CO2)
MOLEC = 3 implies Ozone (O3)
MOLEC = 4 implies Nitrous oxide (N2O)
MOLEC = 5 implies Carbon monoxide (CO)
MOLEC = 6 implies Methane (CH4)
MOLEC = 7 implies Oxygen (O2)
MOLEC = 8 implies Nitric oxide (N0)
MOLEC = 9 implies Sulfur dioxide (SO2)
MOLEC = 10 implies Nitrogen dioxide (NO2)
MOLEC = 11 implies Ammonia (NH3)
MOLEC = 12 implies Nitric acid (HNO3)
MOLEC = 13 implies Hydroxyl radical (OH)
MOLEC = 14 implies Hydrogen fluoride (HF)
MOLEC = 15 implies Hydrogen chloride (HCl)
MOLEC = 16 implies Hydrogen bromide (HBr)
MOLEC = 17 implies Hydrogen iodide (HI)
MOLEC = 18 implies Chlorine monoxide (ClO)
MOLEC = 19 implies Carbonyl sulfide (OCS)
MOLEC = 20 implies Formaldehyde (H2CO)
MOLEC = 21 implies Hypochlorous acid (HOC1)
MOLEC = 22 implies Nitrogen (N2)
MOLEC = 23 implies Hydrogen cyanide (HCN)
MOLEC = 24 implies Methyl chloride (CH3Cl)
MOLEC = 25 implies Hydrogen peroxide (H2O2)
MOLEC = 26 implies Acetylene (C2H2)
MOLEC = 27 implies Ethane (C2H6)
MOLEC = 28 implies Phosphine (PH3)
MOLEC = 29-32 are for future growth
MOLEC = 33 implies CFC-11 (CCl3F)
MOLEC = 34 implies CFC-12 (CCl2F2)
MOLEC = 35 implies CFC-13 (CClF3)
MOLEC = 36 implies CFC-14 (CF4)
MOLEC = 37 implies CFC-22 (CHF2C1)
MOLEC = 38 implies CFC-113 (C2CL3F3)
MOLEC = 39 implies CFC-114 (C2C12F4)
MOLEC = 40 implies CFC-115 (C2C1F5)
MOLEC = 41 implies ClON02
MOLEC = 42 implies HNO4
MOLEC = 43 implies CHCl2F
MOLEC = 44 implies CCl4
MOLEC = 45 implies N2O5

PARAMETER Declarations:

INTEGER       MLIDMX
PARAMETER     (MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC    EXP,DPROD,REAL,DOUBLE
EXTERNAL      MOLPESD

Local Variable Declarations:

INTEGER       I
REAL          TREF
DOUBLE PRECISION    QROT,QVIB,QV,QV0

COMMON Blocks: /MOLDAT/
REAL FUNCTION PFR

Argument Declarations:

* T - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SQRT, EXP

Local Variable Declarations:

INTEGER J
REAL VIB(3), QJ, T1, T2, T1S, T2S, V, T11, T22

COMMON Blocks: None
SUBROUTINE PHFUNC

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm⁻¹)
IAERO - INTEGER Variable (Input) - Index for aerosol type
ICLOUD - INTEGER Variable (Input) - Index for water cloud type
ICLRDN - INTEGER Variable (Input) - Index for cloud and rain
IICE - INTEGER Variable (Input) - Index for ice cloud type
ICIRUS - INTEGER Variable (Input) - Index for cirrus cloud type
RNRATE - REAL Variable (Input) - Rain rate (mm/hr)
SNRATE - REAL Variable (Input) - Snowfall rate (mm/hr in equiv. water)
L - INTEGER Variable (Input) - Altitude index
SCTM - REAL Variable (Input) - Molecular single-scattering coefficient (km⁻¹)
SCTA - REAL Variable (Input) - Aerosol single-scattering coefficient (km⁻¹)
SCTC - REAL Variable (Input) - Water cloud single-scattering coefficient (km⁻¹)
SCTI - REAL Variable (Input) - Ice cloud single-scattering coefficient (km⁻¹)
SCTR - REAL Variable (Input) - Rain single-scattering coefficient (km⁻¹)
SCTS - REAL Variable (Input) - Snow single-scattering coefficient (km⁻¹)
SCTCI - REAL Variable (Input) - Cirrus cloud single-scattering coefficient (km⁻¹)
TEMP - REAL Variable (Input) - Temperature (K)
KK - INTEGER Variable (Input) - Latitude index
LL - INTEGER Variable (Input) - Longitude index

PARAMETER Declarations:

INTEGER MLMAX, NWLAER, NWLCLD, NANG, MAXLAT, MAXLON, NSTTMP
PARAMETER (MLMAX=140, NSTTMP=16)
PARAMETER (NWLAER=47, NWLCLD=79, NANG=65)
PARAMETER (MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

REAL CSPHFN
INTRINSIC MIN, ABS
EXTERNAL PROFAC, PHFGBD, PHSTBD, PHTRED, ARSLED, PHMABD,
CSPHFN, PHYDRO, PHURED, PHRUBD, PHOCEBD, BKSBD

Local Variable Declarations:

INTEGER JWL(8), JWL(8), I, JTMP, JTMP
REAL FACWL(8), WLC, ASYWC, ASYIC, ASYMR, ASYMS, P1, P2,
ASYMM, SCTSUM, FACTMP, ASYDUM, ASYCI, WLC

COMMON Blocks:

/AEROSL/, /AERSCA/, /AERUSR/, /ARSLS/, /BSTAER/
/CONSTN/, /PHFOG/, /PHFWR/, /PHFOCE/, /PHFRUR/
/PHFSTR/, /PHFRP/, /PHFRB/
REAL FUNCTION PHMLSC

Argument Declarations:

V      - REAL Variable - Wavenumber (cm⁻¹)
PHI    - REAL Variable - Scattering angle (deg)

INTRINSIC and EXTERNAL Declarations:

REAL    DEPOL
        INTRINSIC COS
        EXTERNAL DEPOL

Local Variable Declarations:

REAL    WL,DPL

COMMON Blocks: /CONSTN/

SUBROUTINE PHYDRO

Argument Declarations:

V      - REAL Variable (Input) - Wavenumber (cm⁻¹)
ICLOUD - INTEGER Variable (Input) - Index for water cloud type
ICLOUDR - INTEGER Variable (Input) - Index for cloud and rain
SCPC   - REAL Variable (Input) - Scattering coefficient for clouds (km⁻¹)
TICE   - INTEGER Variable (Input) - Index for ice cloud type
STCI   - REAL Variable (Input) - Scattering coefficient for ice clouds (km⁻¹)
ICIRUS - INTEGER Variable (Input) - Index for cirrus cloud type
STCRI  - REAL Variable (Input) - Scattering coefficient for cirrus (km⁻¹)
RNRATE - REAL Variable (Input) - Rain rate (mm/hr)
SNRATE - REAL Variable (Input) - Snowfall rate (mm/hr in equiv. water)
SCTS   - REAL Variable (Input) - Scattering coefficient for snow (km⁻¹)
ASYWC  - REAL Variable (Output) - Water cloud asymmetry factor
ASYIC  - REAL Variable (Output) - Ice cloud asymmetry factor
ASYMR  - REAL Variable (Output) - Rain asymmetry factor
ASYMS  - REAL Variable (Output) - Snow asymmetry factor
ASYCI  - REAL Variable (Output) - Cirrus cloud asymmetry factor
TEMP   - REAL Variable (Input) - Temperature (K)

PARAMETER Declarations:

INTEGER NWLAER,NWLCLD,NANG
        (NWLAER=47, NWLCLD=79, NANG=65)

INTRINSIC and EXTERNAL Declarations:

REAL    CSPFNP,XTERP
        INTRINSIC PROFAC,PHYBD,CSPFNP,CIRRBX,XTERP,ARSLBD
        EXTERNAL

Local Variable Declarations:

INTEGER KWL,KWLP,KRT,KRTP,I,KTP,KTPP,JCIR,ITRPO
        FACTL,WXL,WLY,FACTR,FACTP,ASYM1,ASYM2

COMMON Blocks: /AEROSL/,/CLDUSR/,/CONSTN/,/CRASYM/,/PHHYDR/
REAL FUNCTION PLANCK

Argument Declarations:

TEMP - REAL Variable - Temperature (K)
V    - REAL Variable - Wavenumber (cm⁻¹)
DV   - REAL Variable - Wavenumber increment (cm⁻¹)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, DBLE, EXP, DPROD, LOG

Local Variable Declarations:

INTEGER I
REAL VP
DOUBLE PRECISION X, Y, C1, C2, XMU(3), WT(3), DPLANCK

COMMON Blocks: /CONSTN/

SUBROUTINE PLANET

Argument Declarations:

CENT - DOUBLE PRECISION Variable (Input) - Universal time in centuries from 1900.0
LABSUN - DOUBLE PRECISION Variable (Input) - Mean longitude
ANOMN - DOUBLE PRECISION Variable (Input) - Mean anomaly
PERTUB - DOUBLE PRECISION Variable (Output) - Planetary nutation and longitude perturbations
PERVEN - DOUBLE PRECISION Variable (Output) - Latitude perturbations of sun by Venus
PERJUP - DOUBLE PRECISION Variable (Output) - Latitude perturbations of sun by Jupiter
XMNLAT - DOUBLE PRECISION Variable (Output) - Moon mean argument of latitude
OBLNUT - DOUBLE PRECISION Variable (Output) - Nutation in obliquity

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MOD, SIN, COS

Local Variable Declarations:

DOUBLE PRECISION DDCIR, ANOMLN, ELONLN, ANOMVN, PERT, ANOMAR, ANOMJP,
        ANOMSA, XNUTLN, PERINE, ASCNOD, XLONGN

COMMON Blocks: /CONSTN/
SUBROUTINE PLMSUB

Argument Declarations:

- **XN** - REAL Array (Dim = NGAS x Unspecified) (Output) - Optical depth for Lorentz line width
- **ACNP** - REAL Array (Dim = NGAS x Unspecified) (Output) - Summing variable for Doppler Line width
- **ACND** - REAL Array (Dim = NGAS x Unspecified) (Output) - Summing variable for each atmospheric gas specie and each line group
- **COMA** - REAL Array (Dim = NGAS x Unspecified) (Output) - Optical depth for each atmospheric gas specie
- **TAUL** - REAL Vector (Len = Unspecified) (Output) - Optical depth for molecular scattering
- **COMAE** - REAL Variable (Output) - Optical depth for aerosols
- **SLTSC** - REAL Variable (Output) - Optical depth due to aerosol and molecular scattering
- **CNTCO2** - REAL Variable (Output) - Optical depth due to CO2 continuum
- **CNTH2O** - REAL Variable (Output) - Optical depth due to H2O continuum
- **NM** - INTEGER Variable (Input) - Azimuth index

PARAMETER Declarations:

- **INTEGER**
  - MLMAX, MMLX2, NZYMAX, NGAS, NNMMAX, ISMX, MAXLAT, MAXLON, NGMAX, MOLMAX, MLIDMX
  - (MLMAX=140, MMLX2=2*MLMAX, MLIDMX=45)
  - (NGAS=6, NNMMAX=5, MOLMAX=26, ISMX=MOLMAX+8)
  - (NGMAX=15, NAZMX=30)
  - (MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

- **REAL**
  - COMFNC
- **EXTERNAL**
  - COMFNC, MOLPBD

Local Variable Declarations:

- **INTEGER**
  - I, K, L, KL, IV, MLC, KK, LL
- **REAL**
  - P0, PS, DUMA, DUMB, DUMF, DUMG, DUMH, SDX, CDX, CDY, ADX, ALX, CD1, CD2

COMMON Blocks:

- /INITIAL/, /MOLCON/, /MOLECP/, /PATH1/, /PATH1A/, /PLMDAT/, /PRBND/, /PRBBND/

DOUBLE PRECISION FUNCTION POLY

Argument Declarations:

- **X** - DOUBLE PRECISION Variable - Argument
- **C** - DOUBLE PRECISION Vector (Len = Unspecified) - Coefficients
- **N** - INTEGER Variable - Length of C

Local Variable Declarations:

- **INTEGER**
  - I

COMMON Blocks:

- None

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SUBROUTINE PRALT

Argument Declarations:

PRESS - REAL Variable (Input) - Atmospheric pressure (mb)
ALT - REAL Variable (Output) - Pressure altitude (km)
IERR - INTEGER Variable (Output) - Error flag
   IERR = 0 implies no error
   IERR = 1 implies PRESS is greater than 1777.6 mb
   IERR = 2 implies PRESS is less than 0.0044568 mb

INTRINSIC and EXTERNAL Declarations:

   INTEGER     IBNSRC
   INTRINSIC    MIN, LOG
   EXTERNAL     IBNSRC

Local Variable Declarations:

   INTEGER     KEY, KEYP
   REAL        Z(58), P(58), FAC

COMMON Blocks: None
SUBROUTINE PRCALC

Argument Declarations:

*  IFSCRI - INTEGER Variable (Input) - File number for source skyshine solar path data
  INITV - INTEGER Variable (Input) - Initial value for spectral loop. For standard calculations, INITV = 1. For restart calculations, it provides the value at which to restart.
  INITGM - INTEGER Variable (Input) - Initial value for geometry loop. For standard calculations, INITGM = 1. For restart calculations, it provides the value at which to restart.
  IV - INTEGER Variable (Input) - Spectral interval number
  HEADING - CHARACTER(*) Variable (Input) - File heading
  TITLE - CHARACTER(*) Variable (Input) - File title
  IFLT - INTEGER Variable (Input) - Filter index
  TFLT - CHARACTER(*) Variable (Input) - Filter title
  ISMARY - INTEGER Variable (Input) - Summary index
  ISWATM - INTEGER Array (Dim = MAXLAT x Unspecified) (Input) - Switch for model atmospheres

PARAMETER Declarations:

  INTEGER
    NAZMAX, NASMAX, NGAS, NNNMAX, MLMAX, ISMX, MLMX2,
    ISTMAX, NBAND, NGMAX, NZSMAX, NMATL, NWLAER,
    NWLCLD, NANG, MAXLAT, MAXLON, NL, NVSMAX, MOLMAX,
    MLIDMX
  PARAMETER
    (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
  PARAMETER
    (MLMAX=140, MLMX2=2*MLMAX)
  PARAMETER
    (MLMAX=26, ISMX=MLMAX+8, MLIDMX=45)
  PARAMETER
    (ISTMAX=30000)
  PARAMETER
    (NBAND=16, NNNMAX=5, NGAS=6, NMATL=28)
  PARAMETER
    (NWLAER=47, NWLCLD=79, NANG=65)
  PARAMETER
    (MAXLAT=3, MAXLON=1, NVSMAX=20)
  PARAMETER
    (NL=50)

INTRINSIC and EXTERNAL Declarations:

  REAL
  CHARACTER*72
  INTRINSIC
  EXTERNAL
    SOLAR, SLUNAR, SCINTL, PLANCK, DPLDT, FILTER
    IOERR
    MAX, MN, REAL, SORT, LOG
    BNDPAR, SOLAR, BNTPTH, PLANCK, BCKGND, SOLRAD,
    PHPHAU, RESOLV, SCINTL, DEVCBD, ARSLBD, RSHINE,
    PTHOSB, SMPCAL, SLUNAR, TEMPRF, PLMSUB, IOERR,
    MOLPBD, COUPLE, MLCAT, DPLDT, XPNDAR, INTEG,
    INDXBK, KDISTR, ATMPRN, BCKPRN, FILTER, ZROINT,
    ATMSBD, DISPRN

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SUBROUTINE PRCALC (continued)

Local Variable Declarations:

INTEGER  I, K, L, M, N, MM, IZ, KL, LB, IOS, ITYP1, MM1, NLNTOT,
          KSCENE (MAXLAT, MAXLON), LPS, LPL, KK, LL, NVP, IP,
          KDIV1, KDIV2, LLE, ISTOR1, IGEOM, NLOCAT, NSLTOT

REAL     XN (NGAS, NNMMAX), RDSLSP (NAZMAX, MLMX2, 2), V,
          ACNP (NGAS, NNMMAX), ACND (NGAS, NNMMAX), TNOON,
          COMA (NGAS, NNMMAX), FLTR, TAUPLM (NGAS), V1P, V2P,
          S1 (ISMX), S2 (ISMX), S3 (ISMX), SOLX, S4 (ISMX),
          S5 (ISMX), S6T (ISMX), S7T (ISMX), RT4, RSL, SLTSC,
          DRAP2, S3T (ISMX), S4T (ISMX), TAUX, AZL, XLUN,
          S5T (ISMX), RADSLP (NAZMAX, MLMX2), DV, TMIODN,
          RDLNP (NAZMAX, MLMX2), PROJS (6, NAZMAX, NGMAX),
          PROJL (6, NAZMAX, NGMAX), HSKYSH, HSCATT, COMAE,
          DRAPD (NAZMAX, MLMX2), RADPTH (NAZMAX, MLMX2, 2),
          SIGMEP (NAZMAX, MLMX2), TAUSCP (NAZMAX, MLMX2),
          PIHBM (NAZMAX), SOLA2P, AZS, BW, BWL, RDSCVS,
          CNTCO2, CC, RDSCSV, RR2X (NAZMAX), CNTH2O, RDLNSP,
          TaulR (NAZMAX, MLMX2), BKSUMV (6, NMATL, NAZMAX),
          ALNTAU, BLNTAU, TAUMG, TAUTC, TAUHSC, TAUHAB,
          TLSL, TLSB, AZO, RADSLS (NZSMAIN, NASMAX),
          RDLNS (NZSMAIN, NASMAX), S6 (ISMX), S7T (ISMX),
          AZIMP (NAZMAX), SHDWS (NAZMAX, NGMAX),
          SHDWL (NAZMAX, NGMAX)

DOUBLE PRECISION  X5 (ISMX), XST (ISMX), SCT1S, SCT1L, SCT3S, SCT3L,
                   TAUL (MLMX2), Taula (MLMX2)

LOGICAL  FLBCKZ (NGMAX), FLTRUE

COMMON Blocks:

/AEROSL/, /ARSLSC/, /ATMDAT/, /BCKDAT/, /CONSTN/,
/CURGDA/, /CURGDB/, /CURGDC/, /DEVICE/, /FLAGS/,
/INITAL/, /INTSTO/, /HEADER/, /KDISDT/, /LYRSTO/,
/MOLCON/, /MOLECP/, /MSPARM/, /OPTDEP/, /PATH1/,
/PATH1A/, /PATH4/, /PATH5A/, /PATH5B/, /PATH5C/,
/PATH5D/, /PATH6/, /PATH8/, /TRANSP/
SUBROUTINE PRETEM

Argument Declarations:

T  - REAL Vector (Len = Unspecified) (Output) - Temperature (K)
P  - REAL Vector (Len = Unspecified) (Output) - Pressure (mb)
ZP - REAL Vector (Len = Unspecified) (Output) - Altitude (m)
    versus pressure
UP - REAL Vector (Len = Unspecified) (Output) - H₂O density
    (scaled LOWTRAN units) versus pressure
VP - REAL Vector (Len = Unspecified) (Output) - CO₂ density
    (scaled LOWTRAN units) versus pressure
WP - REAL Vector (Len = Unspecified) (Output) - O₃ density
    (scaled LOWTRAN units) versus pressure
HB - REAL Variable (Input) - Terrain altitude (km)
CLALT - REAL Vector (Len = Unspecified) (Input) - Cloud base altitudes (km)
    1 - Low etage
    2 - Middle etage
    3 - High etage
CLALT - REAL Vector (Len = Unspecified) (Input) - Cloud top altitudes (km)
    1 - Low etage
    2 - Middle etage
    3 - High etage
TAIRLC - REAL Variable (Input) - Surface air temperature (K)
PAIRLC - REAL Variable (Input) - Surface air pressure (mb)
CH2OCLC - REAL Variable (Input) - Surface water vapor content (ppmv)
KK - INTEGER Variable (Input) - Latitude index
LL - INTEGER Variable (Input) - Longitude index

PARAMETER Declarations:

INTEGER         MLMAX, ISMX, MAXLAT, MAXLON, NGMAX, MOLMAX, MLIDMX
PARAMETER       (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER       (MAXLAT=3, MAXLON=1, NGMAX=15, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC        REAL, INT, LOG, MAX, MIN, ABS
EXTERNAL         MOLPBD

Local Variable Declarations:

INTEGER         JK, IP, IP1, IP2, IL, J2, JMAX, JFMAX
REAL            ALTLAY(10), HP, DELZ, DELZP, P0, T0, DENSJ, DENSJP,
                DP, T1, P1, H1, T2, P2, H2, FAC

COMMON Blocks:   /CLIMAT/, /CONSTN/, /INITAL/, /MOLCON/
SUBROUTINE PROFAC

Argument Declarations:

X0 - REAL Variable (Input) - Value of X for which interpolation will be performed
X - REAL Vector (Len = Unspecified) (Input) - X-array (must be monotonically increasing
N - INTEGER Variable (Input) - Dimension of X-array
KEY - INTEGER Variable (Output) - Position in X-array for which the X0-value is adjacent
FAC - REAL Variable (Output) - The proportional factor for interpolation

INTRINSIC and EXTERNAL Declarations:

INTEGER IBNSRC
INTRINSIC MAX, MIN, ABS
EXTERNAL IBNSRC

Local Variable Declarations:

INTEGER KEYP
REAL DX

COMMON Blocks: /CONSTN/

SUBROUTINE PROMPT

Argument Declarations:

STRING - CHARACTER*(*) Variable - Prompt request

Local Variable Declarations: None

COMMON Blocks: None
SUBROUTINE PRTHDR

Argument Declarations:

NFILE - INTEGER Variable (Input) - Device number

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX,
        NVSMAX, MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL IOERR

Local Variable Declarations:

INTEGER K, L, M, ICS, KK, LL, MM, IV, IGEOM

COMMON Blocks: /HEADER/
SUBROUTINE PTHOSB

Argument Declarations:

L - INTEGER Variable (Input) - Location in integration
TAUL - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Transmittance along observer-source-background path
TAULA - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Transmittance due to absorption along the observer-source-background path
RADPTh - REAL Variable (Output) - Path thermal radiance (W/cm²/sr/cm⁻¹)
DRADB2 - REAL Variable (Output) - Variance in path thermal radiance (W/cm²/sr/cm⁻¹)²
RR2X - REAL Variable (Input/Output) - Second integral in EXPIRT for scattering case (W/cm²/sr/cm⁻¹)
TAUSCP - REAL Variable (Input/Output) - Transmittance, including scattered out of the beam, but still received by the observer
PTHFAC - REAL Array (Len = MAXLAT x Unspecified) (Input) - Proportionality factor for multiple atmospheres
NPTH - INTEGER Array (Dim = 2 x Unspecified) (Input) - Limits for non-zero elements of PTHFAC

PARAMETER Declarations:

INTEGER
MLMAX, MLMX2, NAZMAX, NBAND, ISMX, NANG, MAXLAT, MAXLON, NGMAX, NASKAX, NZSMAX, NVSMAX, MOLMAX, MLIDMX

PARAMETER
(MLMAX=140, MLMX2=2*MLMAX, NAZMAX=30, NGMAX=15)
PARAMETER
(NBAND=16, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER
(NASMAX=15, NZSMAX=4, NANG=65, MLIDMX=45)
PARAMETER
(MAXLAT=3, MAXLON=1, NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

REAL RADTRX
INTRINSIC REAL, DPROM, ABS, COS, SQRT, DBLE, ATAN2, EXP, MAX
EXTERNAL RADTRX

Local Variable Declarations:

INTEGER K, KL, KLM, KK, LL, LX
REAL DUM, ACCZ, DUMP, ASYM, SCTRZ, SCTRZ
DOUBLE PRECISION PKL1, PKL2, DPKL1, DPKL2, DELTAU, SUMP, SUM

COMMON Blocks:
/ARSLSC/,/CONSTN/,/CURGDC/,/HEADER/,/INITIAL/,
/LYRSTO/,/MOLEC/,/PATH1/,/PRBND/
SUBROUTINE PTHTAU

Argument Declarations:

- N - INTEGER Variable (Input) - Number of increments along path
- ITL - INTEGER Vector (Len = Unspecified) (Input) - Point in altitude grid for each path increment
- DR - REAL Vector (Len = Unspecified) (Input) - Length of each incremental path segment (km)
- XSI - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Optical depth superimposed on Lorentz halfwidth times line density
- S1 - REAL Vector (Len = Unspecified) (Input) - Summing variable for Doppler halfwidth times line density
- S2 - REAL Vector (Len = Unspecified) (Input) - Summing variable for Doppler halfwidth times line density
- S3 - REAL Vector (Len = Unspecified) (Input) - Summing variable for line density
- S4 - REAL Vector (Len = Unspecified) (Input) - Summing variable for the continuum
- S5 - REAL Vector (Len = Unspecified) (Input) - Summing variable for scattering
- S6 - REAL Vector (Len = Unspecified) (Input) - Summing variable for (Lorentz halfwidth)^2 times line density
- TAUF - REAL Variable (Output) - Transmittance for the whole path
- TAU - DOUBLE PRECISION Vector (Len = Unspecified) (Output) - Transmittances at each point along path (i.e., an incremental set of transmittances)
- TAUA - DOUBLE PRECISION Vector (Len = Unspecified) (Output) - Transmittance due to absorption
- ITYPE - INTEGER Variable (Input) - Calculation index
  ITYPE = 0 implies that only the final transmittance is calculated
  ITYPE = 1 implies that incremental transmittance is calculated
- ISTORE - INTEGER Variable (Input) - Storage index
  ISTORE = 0 implies no intermediate storage
  ISTORE = 1 implies intermediate storage required
- PTHFAC - REAL Array (Dim = MAXLAT MAXLON x Unspecified) (Input) - Proportionality factor for path
- NPTH - INTEGER Array (Dim = 2 x Unspecified) (Input) - Limits for non-zero elements of PTHFAC
- FLTRN - LOGICAL Variable (Input) - Flag for storing component transmission values
- NO - INTEGER Variable (Input) - Increment for which transmission values are to be stored
- MM - INTEGER Variable (Input) - Azimuth index
- DV - REAL Variable (Input) - Wavenumber increment (cm^-1)

PARAMETER Declarations:

- INTEGER MMAX, MMAX2, ISMX, MAXLAT, MAXLON, MOLMAX, MLIDMX
- PARAMETER (MLMAX=140, MMAX2=2*MLMAX)
- PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
- PARAMETER (MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

- INTRINSIC MAX, REAL, DPROD
- EXTERNAL TRNSMT, BNTPTH

Local Variable Declarations:

- INTEGER K, L, LM, KL, KLM, KK, LL
- REAL S1P(ISMX), S2P(ISMX), S3P(ISMX), S4P(ISMX), S5P(ISMX), DELTAU, DUNS, DUMC, DUMC, DUM1, DUM2, DR2, DUM4, S6P(ISMX)
- DOUBLE PRECISION XSP(ISMX), TAUD, SCFP
- LOGICAL FLAG

COMMON Blocks:

/CONSTN/, /CGWTS/, /CURGDA/, /CURGDB/, /CURGDC/, /MOLECP/, /OPTDEF/, /PRBNDA/, /PRBNDB/

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SUBROUTINE PUTCLD

Argument Declarations: None

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX,
        NVSMAX, MOLMAX
PARAMETER (NGMAX=15, NASMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL CHRCBD, DEVCBD, CLDRBD, IOERR

Local Variable Declarations:

INTEGER IOS, K, KK, LL

COMMON Blocks: /CHRCNK/, /CLDRN/, /DEVICE/, /HEADER/

SUBROUTINE PUTHDR

Argument Declarations:

INITV - INTEGER Variable (Input) - Initial value for spectral loop. For
        standard calculations, INITV = 1. For restart calculations, it
        provides the value at which to restart.
LATST - REAL Vector (Len = Unspecified) (Input) - Latitude grid
LONST - REAL Vector (Len = Unspecified) (Input) - Longitude grid
MTIME - INTEGER Variable (Input) - Number of temporal variables

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGAS, MLMAX, ISMX, NGMAX, NZSMAX, NBAND,
        MAXLAT, MAXLON, NVSMAX, MOLMAX, MLIDMX
PARAMETER (NGMAX=15, NASMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MLMAX=140, MLIDMX=45)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, NGAS=6, NBAND=16)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
REAL POTHDR, IOERR, DEVCBD, MOLPBD

Local Variable Declarations:

INTEGER L, NVARA(NGMAX), NVARB(NGMAX), NVARP(NGMAX), KK, LL,
        NVARM(NGMAX), NVARH(NGMAX), NVART(NGMAX), IG,
        NVH(NVSMAX), NHDR(2), NHDRB(2), NHDRM(2), ITP,
        NHDRH(2), IZ, IOS, IGEOM, NGEOMH, NVSETH

COMMON Blocks: /BCKDAT/, /DEVICE/, /HEADER/, /INITIAL/, /MOLCON/,
                 /MOLCP/
SUBROUTINE PUTSLR

Argument Declarations: None

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX,

PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)

PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)

PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

REAL SLRCNT
CHARACTER*72 IOERR
EXTERNAL SLRCNT, DEVCBD, IOERR

Local Variable Declarations:

INTEGER IOS
REAL SLRC
CHARACTER*8 LOCAT(2)

COMMON Blocks: /DEVICE/, /FLAGS/, /HEADER/

REAL FUNCTION RAB

Argument Declarations:

R1 - REAL Variable - Diffuse reflection coefficient, layer 1
R1S - REAL Variable - Directional reflection coefficient, layer 1
R2 - REAL Variable - Diffuse reflection coefficient, layer 2
R2S - REAL Variable - Directional reflection coefficient, layer 2
R3 - REAL Variable - Diffuse reflection coefficient, layer 3
T2 - REAL Variable - Transmission, layer 2
T3 - REAL Variable - Transmission, layer 3
G - REAL Variable - Composite R and T from FUNCTION GAM

Local Variable Declarations:

REAL T, TT

COMMON Blocks: None
REAL FUNCTION RADFRLD

Argument Declarations:

TEMPI - REAL Variable - Temperature (K)

V - REAL Variable - Wavenumber (cm⁻¹)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, DPROD, EXP

Local Variable Declarations:

REAL TREF

DOUBLE PRECISION DUM, DUM0

COMMON Blocks: None

REAL FUNCTION RADTRX

Argument Declarations:

Y1 - DOUBLE PRECISION Variable - Value of Y(X1)

X1 - DOUBLE PRECISION Variable - Initial point of integration

Y2 - DOUBLE PRECISION Variable - Value of Y(X2)

X2 - DOUBLE PRECISION Variable - Final point of integration

INTRINSIC and EXTERNAL Declarations:

INTRINSIC LOG, ABS, MAX, MIN, REAL

Local Variable Declarations:

DOUBLE PRECISION DX1, DX2, DY1, DY2, XLNX, XLNY

COMMON Blocks: /CONSTN/

REAL FUNCTION RADTRY

Argument Declarations:

Y1 - DOUBLE PRECISION Variable - Value of Y(X1)

Y2 - DOUBLE PRECISION Variable - Value of Y(X2)

DX - DOUBLE PRECISION Variable - Increment of integration

INTRINSIC and EXTERNAL Declarations:

INTRINSIC LOG, ABS, REAL, MAX

Local Variable Declarations:

DOUBLE PRECISION DY1, DY2, XLNY

COMMON Blocks: /CONSTN/
REAL FUNCTION RAINEX

Argument Declarations:

- RATE - REAL Variable - Rain rate (mm/hr)
- ITYPE - INTEGER Variable - Type of distribution
  ITYPE = 1 implies a Marshall-Palmer distribution
  ITYPE = 2 implies a Drizzle (Joss and Waldvogel)
  ITYPE = 3 implies a Widespread rain (Joss and Waldvogel)
  ITYPE = 4 implies a Thunderstorm (Joss and Waldvogel)
  ITYPE = 5 implies a Thunderstorm (Sekhon and Srivastava)

INTRINSIC and EXTERNAL Declarations:

EXTERNAL RAINBD

Local Variable Declarations:

REAL XN, ALPH
COMMON Blocks: /CONSTN/, /RAINTP/

SUBROUTINE RAINSP

Argument Declarations:

- WL - REAL Variable (Input) - Wavelength (μm)
- RATE - REAL Variable (Input) - Rain rate (mm/hr)
- TEMP - REAL Variable (Input) - Temperature (K)
- IRAIN - INTEGER Variable (Input) - Type of rain distribution
  IRAIN = 1 implies a Marshall-Palmer Distribution
  IRAIN = 2 implies a drizzle (Joss and Waldvogel)
  IRAIN = 3 implies a widespread rain (Joss and Waldvogel)
  IRAIN = 4 implies a thunderstorm (Joss and Waldvogel)
  IRAIN = 5 implies a thunderstorm (Sekhon and Srivastava)
- RNABS - REAL Variable (Output) - Normalized absorption coefficient
- RNSTCT - REAL Variable (Output) - Normalized scattering coefficient

PARAMETER Declarations:

INTEGER NWLCLD
PARAMETER NWLCLD=79

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
INSTRN INSTRN
EXTERNAL PROFAC, XTERP, CLDRBD, RAINBD

Local Variable Declarations:

INTEGER KEYNL, KEYWLP, ITYPE, KEYTP, KEYTPP, NVAR7, ITRP0
REAL RATEFF, RA1, RA2, RX1, RX2, FACWL, FACTP, RA11, RA12, RA21, RA22, RX11, RX12, RX21, RX22

COMMON Blocks: /CLDRN/, /RAINTP/, /RAINWL/
SUBROUTINE RAYPTH

Argument Declarations:

L1 - INTEGER Variable (Input) - Altitude index for the initial point of the ray
L2 - INTEGER Variable (Input) - Altitude index for the final point of the ray
PHI1 - DOUBLE PRECISION Variable (Input) - Elevation angle at the initial point of the ray (rad)
LENF - INTEGER Variable (Input) - Index for path length
LENF = 0 implies the short path
LENF = 1 implies the long path (if it exists)
R - REAL Vector (Len = Unspecified) (Output) - Array of cumulative slant ranges along the ray (km)
PHI - REAL Vector (Len = Unspecified) (Output) - Array of elevation angles along the ray (rad)
THETA - REAL Vector (Len = Unspecified) (Output) - Array of earth-center angles along the ray (rad)
IZ - INTEGER Vector (Len = Unspecified) (Output) - Array of altitude indices along the ray
KL - INTEGER Variable (Output) - Number of elements in the arrays R, PHI, THETA, and IZ
KLMAX - INTEGER Variable (Input) - DIMENSION of R, PHI, THETA, and IZ
IBKGD - INTEGER Variable (Output) - Background index
Note - If ray path terminates at a point other than L2, the input value is changed so that IBKGD = -3 if the ray terminates in space, and IBKGD = -4 if the ray terminates on the earth (i.e., L = 1)
HTNGT - REAL Variable (Input/Output) - Tangent altitude (km)
NLAT - INTEGER Variable (Input) - Number of latitudes
NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER MLMAX, ISMX, MAXLAT, MAXLON, NGMAX, MOLMAX
PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, INT, COS, ACOS, SIN, DBLE, SIGN, ABS, MAX, MIN
EXTERNAL TANGPT

Local Variable Declarations:

INTEGER J, K, JP, JM, JMM, ICHK, IDRCT, KLAT, KLN
DOUBLE PRECISION SNELL, PX1, PX2, MH, MHP, XDRCT, RD, RX, TD, DZ, DPHI1, DPHI2, PX0, DFACT, XMH0, DXMH1, DXMH2

COMMON Blocks: /INITIAL/
REAL FUNCTION RBE

Argument Declarations:

- R1 - REAL Variable - Diffuse reflection coefficient, layer 1
- R1S - REAL Variable - Directional reflection coefficient, layer 1
- R2 - REAL Variable - Diffuse reflection coefficient, layer 2
- R2S - REAL Variable - Directional reflection coefficient, layer 2
- R3 - REAL Variable - Diffuse reflection coefficient, layer 3
- R3S - REAL Variable - Directional reflection coefficient, layer 3
- T3 - REAL Variable - Transmission, layer 3
- T2 - REAL Variable - Transmission, layer 2
- G - REAL Variable - Composite R and T from FUNCTION GAM

Local Variable Declarations:

REAL T, TT

COMMON Blocks: None

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SUBROUTINE RDFLTR

Argument Declarations:

- IFLTR - INTEGER Variable (Input/Output) - Filter index
  For now, it is 1 for all user-defined filters.
- TFLTR - CHARACTER(*) Variable (Output) - Name of filter response
  This name is printed out on the ASCII printout.

PARAMETER Declarations:

INTEGER MOLMAX
PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

INTEGER LENSTR
REAL GETVAR
CHARACTER*2 LWCASE
CHARACTER*3 UPCASE
CHARACTER*72 IOERR
INTRINSIC MIN
EXTERNAL DEVCBD, RDLINE, PARSE, GETVAR, UPCASE, IOERR, INFLBD,
LCTRIM, LENSTR, LWCASE

Local Variable Declarations:

INTEGER I, IOS, NDATA, ICOL0, ICOL40, NVAR3, KODE, NW, NF, IPT,
IPRINT, NLOW, NEW, LENP, IFWV
REAL TEMP
CHARACTER*1 DOT
CHARACTER*20 VRDATA(3), IDFIL
CHARACTER*80 TITLE, DUMMY
CHARACTER*255 VARIAB

COMMON Blocks: /DEVICE/, /FLTRDT/, /INFLTR/

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SUBROUTINE RDGBL

Argument Declarations:

XLAT - REAL Variable (Input) - Latitude (deg)
XLONG - REAL Variable (Input) - Longitude (deg)
MONTH - INTEGER Variable (Input) - Month of year
GMT - REAL Array (Dim = 2 x Unspecified) (Output) - Time (GMT dec. hr.)
TSRF - REAL Array (Dim = 2 x Unspecified) (Output) - Surface temperature (K)
CLCV - REAL Array (Dim = 2 x 0:3 x Unspecified) (Output) - Cloud cover (%)
CIRR - REAL Variable (Output) (Output) - Percentage cirrus clouds (%)
CLDRAD - REAL Array (Dim = 2 x 3 x Unspecified) (Output) - Cloud radiance (μW/cm²/sr)
FRSNW - REAL Variable (Output) (Output) - Percentage snow cover (%)
FRICE - REAL Variable (Output) (Output) - Percentage ice (%)

PARAMETER Declarations:

INTEGER MOLMAX
PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

REAL SEAICE
CHARACTER*72 IOERR
INTRINSIC MOD, INT, INDEX, LEN
EXTERNAL DEVCD, IOERR, SEAICE
CIBMV EXTERNAL FILEINF

Local Variable Declarations:

INTEGER I, J, K, IREC, NREC(40), IOS, IPRINT, IXM
CIBMV INTEGER IERR
REAL YLONG, YLAT(41), DLon(40), ZLAT, ZLONG, TERR
LOGICAL FLGBL
CHARACTER*120 NFILe

COMMON Blocks: /DEVCNM/, /DEVICE/
SUBROUTINE RDLINE

Argument Declarations:

* IUNIT - INTEGER Variable (Input) - Unit number
ISKIP - INTEGER Variable (Input) - Number of characters to be
        skipped on initial READ
OUTBUF - CHARACTER(*) Variable (Output) - Buffer for output

* INTRINSIC and EXTERNAL Declarations:

        INTEGER LENSTR
        CHARACTER*72 IOERR
        INTRINSIC MAX,MIN,LEN
        EXTERNAL LCTRIM,LENSTR,IOERR

Local Variable Declarations:

        INTEGER I,K,ISTART,IEND,IMAXLN,IBUFLN,IOS,JMAXLN,KMAX,JSKIP
        CHARACTER*80 IBUFFR,TBUFFR
        LOGICAL FIRST,CONTNU

COMMON Blocks: None
SUBROUTINE RDSCN

Argument Declarations:
XLAT - REAL Variable (Input) - Latitude (deg)
XLONG - REAL Variable (Input) - Longitude (deg)
ALT - REAL Variable (Output) - Altitude [m]
IBK - INTEGER Variable (Output) - Scene index
FRWTR - REAL Variable (Output) - Fraction surface water in scene

PARAMETER Declarations:
INTEGER MOLMAX
PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:
INTEGER IBKCNV
CIBM INTEGER IBITS
CVAX INTEGER JIBITS
CLAH INTEGER JIBITS
CHARACTER*72 IOERR
INTRINSIC MOD, INT, MAX, MIN, INDEX, ABS, LEN
CMIL INTRINSIC IBITS
CVAX INTRINSIC JIBITS
CLAH EXTERNAL JIBITS
CIBM EXTERNAL IBITS
EXTERNAL DEVCD, IOERR, IBKCNV, CITIES
CIBMV EXTERNAL FILEINF

Local Variable Declarations:
INTEGER I, J, IREC, IOS, NLAT, LAT, LON, IPRINT, IXM,
LATMIN, LONMIN, IECO
CMIL INTEGER IFLD(6,6), IFLDV
INTEGER*1 JBK(6,6), IWTR(6,6)
CINT2 INTEGER*2 JBK(6,6), IWTR(6,6)
INTEGER*2 IALT(6,6)
CINT4 INTEGER JBK(6,6), IWTR(6,6), IALT(6,6)
CIBMV INTEGER IERR
REAL YLONG
LOGICAL FLSCN, FLURB
CHARACTER*120 NFILE, URENMN

COMMON Blocks: /DEVCNM/, /DEVICE/

COMPLEX FUNCTION REFEST

Argument Declarations:
REFL - REAL Variable - Normal reflection coefficient

INTRINSIC and EXTERNAL Declarations:
INTRINSIC SQRT, CMPLX, ABS, MAX

Local Variable Declarations:
REAL N, K, DUM
COMMON Blocks: /CONSTN/
DOUBLE PRECISION FUNCTION REFRAC

Argument Declarations:

PRESS - REAL Variable - Atmospheric pressure (mb)
TEMP - REAL Variable - Atmospheric temperature (K)
WH2O - REAL Variable - Volume mixing ratio, water vapor (ppm)
WC02 - REAL Variable - Volume mixing ratio, carbon dioxide (ppm)
WO2 - REAL Variable - Volume mixing ratio, oxygen (ppm)
WL - REAL Variable - Wavelength (μm)
REARTH - DOUBLE PRECISION Variable - Radius of the earth (km)
ALT - REAL Variable - Altitude (km)

If refractivity is desired, input ALT = 0.0; otherwise modified refractivity is returned.

INTRINSIC and EXTERNAL Declarations:

REAL SUPK,PFR
INTRINSIC EXP, DBLE, SQRT
EXTERNAL SUPK, PFR, REFRBD

Local Variable Declarations:

INTEGER L, N2
REAL PH2O, PCO2, PO2, PNRT, V, WCD, CT, CA, SA, GA, PHI, XIF,
PRFL, GAMMA, GAMNR, FREQ
DOUBLE PRECISION NO(3), RTOT, DISP, EPS, S, DENS0(3), DENS

COMMON Blocks: /MMWREF/

REAL FUNCTION RELHUM

Argument Declarations:

CH2O - REAL Variable - Water vapor concentration (ppmv)
PRESS - REAL Variable - Pressure (mb)
TEMP - REAL Variable - Temperature (K)
ITYPE - INTEGER Variable - Type of saturation

ITYPE = 0 implies water vapor
ITYPE = 1 implies ice

INTRINSIC and EXTERNAL Declarations:

REAL SATUR
EXTERNAL SATUR

Local Variable Declarations:

REAL R, RW, EW, RATIO, WH2O, WAIR

COMMON Blocks: None

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SUBROUTINE RESOLV

Argument Declarations:

VI - REAL Variable (Input) - Initial wavenumber (cm\(^{-1}\))
VF - REAL Variable (Input/Output) - Final wavenumber (cm\(^{-1}\))
DVI - REAL Variable (Input) - Initial wavenumber increment (cm\(^{-1}\))
IDV - INTEGER Variable (Input) - Wavenumber/wavelength index
  IDV = 1 implies wavenumber (cm\(^{-1}\))
  IDV = 2 implies wavelength (micron)
  IDV = 3 implies frequency (GHz)
DWL - REAL Variable (Input) - Wavelength increment (micron)
DV - REAL Variable (Output) - Wavenumber increment (cm\(^{-1}\))
IV - INTEGER Variable (Input/Output) - Index for VF
ITYPE - INTEGER Variable (Input) - Calculation index
  ITYPE = 1 implies that DV and IV are calculated for VF
  ITYPE = 2 implies that DV and VF are calculated for IV
  (See note below)

INTRINSIC and EXTERNAL Declarations:

REAL  DVINCR
EXTERNAL DVINCR

Local Variable Declarations:

INTEGER I
REAL  VX, DVP

COMMON Blocks: None
SUBROUTINE RSHINE

Argument Declarations:

* IFSCR - INTEGER Variable (Input) - File number for skyshine solar path data
  If IFSCR = 0, file is not OPEN
* DV - REAL Variable (Input) - Wavenumber increment (cm⁻¹)
* SOLX - REAL Variable (Input) - Exoatmospheric solar irradiance (W/cm²/cm⁻¹)
* XLMN - REAL Variable (Input) - Exoatmospheric lunar irradiance (W/cm²/cm⁻¹)
* XS - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Optical depth
* S1 - REAL Vector (Len = Unspecified) (Input) - Summing variable for Lorentz halfwidth times line density
* S2 - REAL Vector (Len = Unspecified) (Input) - Summing variable for Doppler halfwidth times line density
* S3 - REAL Vector (Len = Unspecified) (Input) - Summing variable for line density
* S4 - REAL Vector (Len = Unspecified) (Input) - Summing variable for the continuum
* S5 - REAL Vector (Len = Unspecified) (Input) - Summing variable for scattering
* S6 - REAL Vector (Len = Unspecified) (Input) - Summing variable for (Lorentz halfwidth)² times line density

SOLXM - REAL Array (Dim = NAZSMX x Unspecified) (Output) - Apparent solar radiance as a function of azimuth (W/cm²/cm⁻¹)
XLMX - REAL Array (Dim = NAZSMX x Unspecified) (Output) - Apparent lunar radiance as a function of azimuth (W/cm²/cm⁻¹)
NAZSMX - INTEGER Variable (Input) - Maximum number of azimuths
V - REAL Variable (Input) - Wavenumber (cm⁻¹)
IGEOM - INTEGER Variable (Input) - Geometry number

PARAMETER Declarations:

INTEGER

MLMAX, MLMX2, ISMX, NBAND, NZSMAX, NWLAER, NWLCLD, NANG,
MAXLAT, MAXLON, NAZSMAX, NASMAX, NMAFL, NGMAX, NVSMAX,
ISTMAX, MOLMAX

PARAMETER

(MLMAX=140, MLMX2=2*MLMAX)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, NBAND=16, NMAFL=28)
PARAMETER (NAZSMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (NWLAER=47, NWLCLD=79, NANG=65)
PARAMETER (NGMAX=15, NVSMAX=20, MAXLAT=3, MAXLON=1)
PARAMETER (ISTMAX=30000)

INTRINSIC and EXTERNAL Declarations:

REAL

RADTRX
CHARACTER*72

IOERR
INTRINSIC

DPROD
EXTERNAL

SOLRAD, RADTRX, BMTPTH, ARSLBD, PTHTAU, MLSCAT,
BCKND, TERMFR, IOERR

Local Variable Declarations:

INTEGER

K, L, M, KK, LL, KL, MM, IOS, LPL, ITYP1, ISTR, L
IGEOM, NAM, NSHM
SIP(ISMX), SIPR(ISMX), S3P(ISMX), N4P(ISMX), RADSCH, N5P(ISMX),
RADSCM, NDSCH, DRSTOR, DSTORS, DSTR, DTRR, RTHSC,
RSLHSC, DUMSUM(6, NMAFL), RDCSCH, CC, SOLAZP,
HSKHSC, HSCTT, PROJSH(6, 1), PHSIDH(1), AZS, AZL,
PROJHL(1, 1), S6P(ISMX), S7HDS(1), SHWNL(1)

DOUBLE PRECISION

XSIP(ISMX), TAUL(MLMX2), TAULR(MLMX2), DELTAU,
PLK1, PLK2, STC15, STC1L, STC35, STC3L

COMMON Blocks:

REAL FUNCTION SATUR

Argument Declarations:

PRESS - REAL Variable - Pressure (mb)
TEMP - REAL Variable - Temperature (K)
ITYPE - INTEGER Variable - Type of saturation
        ITYPE = 0 implies water vapor
        ITYPE = 1 implies ice

INTRINSIC and EXTERNAL Declarations:

INTRINSIC       DBLE,REAL,LOG10

Local Variable Declarations:

REAL          T0,TS,EI0,EWS,EX
DOUBLE PRECISION       DTEMP

COMMON Blocks:       /CONSTN/

REAL FUNCTION SCINTL

Argument Declarations:

VARX - REAL Variable - Path-averaged turbulence (km)
V   - REAL Variable - Wavenumber (cm⁻¹)
APERT - REAL Variable - Aperture diameter (m)
Z   - Real Variable - Distance over which turbulence is averaged (km)

PARAMETER Declarations:

INTEGER       NPTS,MPTS
PARAMETER       (NPTS=10, MPTS=14)

INTRINSIC and EXTERNAL Declarations:

REAL           XTERP
INTRINSIC       MAX,MIN,EXP,SORT
EXTERNAL        PROFAC,XTERP

Local Variable Declarations:

INTEGER       I,KEY,KEYP,ITRPL
REAL          VAR,VAREX,CL0(NPTS),DNORM(MPTS),D0,XK,VAR0,
              THETA(NPTS,MPTS),FACD,T1,T2,THETAD

COMMON Blocks:       /CONSTN/

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SUBROUTINE SCNRI0

Argument Declarations:

* LNP   - INTEGER Variable (Input/Output) - Index for desired ray path in the
case of any ambiguity
   LNP = 0 implies the shorter path
   LNP = 1 implies the longer path

* IGEOM - INTEGER Variable (Input) - Geometry number

* IERR  - INTEGER Variable (Output) - Error index

* ISWATM - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) - Switch
for model atmospheres

PARAMETER Declarations:

INTEGER        MLMAX, MLMX2, ISMX, NAZMAX, NASMAX, ISTMAX, MLIDMK,
               NGMAX, NZSMAX, NL, MAXLAT, MAXLON, NVSMAX, MOLMAX
PARAMETER      (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER      (MLMAX=140, MLMX2=2*MLMAX)
PARAMETER      (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
PARAMETER      (ISTMAX=30000)
PARAMETER      (NL=50)
PARAMETER      (MAXLAT=3, MAXLON=1, NVS.MAX=20)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC      REAL, MAX, MIN, ABS, DBLE, TAN, COS, ACOS, SIN, MOD
EXTERNAL       GEOM, RAYPT, CALENQ, HORSEQ, EQUECL, ECLGAL, HORIZN,
               TURBUL, SPTRIG, DEFBCK, INTR2D, ATMSBD, MOLPB2, SHNGEO

Local Variable Declarations:

INTEGER        KL, K, L, LM, IDAYX, LNB, JBGD, LTERM, ITP, KK, LL,
               KLMAXP, LB, IHORSB, KSW, NLOCAT, MM, LINIT, IPRINT,
               MLAT, MLON, ITYPO
REAL           DYEAR, PHOS, RHOS, BHOS, SRMAX, THD, BETMAX, PHIOR,
               PHI1R, XLEQUT, BEQUT, ASF, SOFA2P, RSOLAR,
               RLUNAR, ELF, HSEND, XLT, AZDUM (NAZMAK), MPI
DOUBLE PRECISION PHITX

COMMON Blocks: /ATMDAT/, /BCKDAT/, /CONSTN/, /FLAGS/, /HEADER/, 
               /INITIAL/, /MOLCON/, /MOLEC/, /PATH1/, /PATH1A/, 
               /PATH4/, /PATH5A/, /PATH5B/, /PATH5C/, /PATH5D/
REAL FUNCTION SEAICE

Argument Declarations:

XLAT   - REAL Variable - Latitude (deg)
XLON   - REAL Variable - Longitude (deg)
IMON   - INTEGER Variable - Month of year

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MOD, INT, MAX, MIN
EXTERNAL SICEBD

Local Variable Declarations:

INTEGER L, LAT, LON, IM, I
REAL      FRICE(12), YLONG

COMMON Blocks: /SICEDT/

REAL FUNCTION SEATMP

Argument Declarations:

MONTH  - INTEGER Variable - Month of year (MONTH = 1 implies Jan)
XLAT   - REAL Variable - Latitude (+ North, - South) (deg)
XLONG  - REAL Variable - Longitude (+ East, - West) (deg)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC INT, MAX, MIN
EXTERNAL OCNTBD

Local Variable Declarations:

INTEGER ISEASON(12), ILAT, ILO
REAL      YLONG

COMMON Blocks: /TMPOCN/

COMPLEX FUNCTION SEAWTR

Argument Declarations:

V      - REAL Variable - Wavenumber (cm⁻¹)
TEMP   - REAL Variable - Temperature (K)

Local Variable Declarations:

INTEGER  N, M
REAL      T0(4), WAVE, DEL1(4), DELB, SIG1(4), SIGB, EP, A, FREQ
COMPLEX   IX, JX

COMMON Blocks: None
SUBROUTINE SETALT

Argument Declarations:

ZP - REAL Vector (Len = Unspecified) (Input/Output) - Basic altitude grid (km)
NLP - INTEGER Variable (Input/Output) - Number of points in basic grid
HXTRA - REAL Vector (Len = Unspecified) (Input/Output) - Extra altitudes in altitude grid (km)
NXTRA - INTEGER Variable (Input/Output) - Dimension of HXTRA
HRI - REAL Vector (Len = Unspecified) (Input) - Observer altitude (km)
HTT - REAL Vector (Len = Unspecified) (Input) - Source altitude (km)
NGEOM - INTEGER Variable (Input) - Number of geometry conditions
HBCK - REAL Variable (Input) - Terrain altitude (km)
ICLDRN - INTEGER Variable (Input) - Cloud index
ZCLD - REAL Vector (Len = Unspecified) (Input) - Cloud altitude grid (km)
CLDBS - REAL Variable (Input) - Cloud base altitude (km)
CLDTP - REAL Variable (Input) - Cloud top altitude (km)
HPRF - REAL Vector (Len = Unspecified) (Input) - Beginning and ending altitudes for background (km)
ZBCK - REAL Vector (Len = Unspecified) (Output) - Background altitude points (km)
TBCK - REAL Array (Dim = MLMX x MAXLAT x Unspecified) (Output) - Background temperatures (K)
LBCK - INTEGER Vector (Len = Unspecified) (Output) - Background altitude indices (km)
NBCKZ - INTEGER Variable (Output) - Number of background altitude points
MT - INTEGER Array (Dim = MAXLAT x Unspecified) (Input) - Model temperature profile index
MLMX - INTEGER Variable (Input) - Maximum number of altitude layers for TBCK
NLAT - INTEGER Variable (Input) - Number of latitudes
NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER MLMX, ISMX, NASMAX, NL, MAXLAT, MAXLON, NGMAX, NLUPR, NTEXO, MOLMAX
PARAMETER (MLMAX=140, NASMAX=15, NL=50)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15, NLUPR=8)
PARAMETER (NTEXO=11)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
INTRINSIC MAX, MIN, ABS, REAL, DBLE
EXTERNAL XTERP, UPPRBD, ATMSBD

Local Variable Declarations:

INTEGER I, J, L, NLX, KK, LL, ITRP0, MTX
REAL H1, ZPX

COMMON Blocks: /ATMDAT/, /CONSTN/, /INITAL/, /UPRATM/, /USERDF/
SUBROUTINE SETBCK

Argument Declarations:

ITYPE  - INTEGER Variable (Input) - Scene index
        Refer to User Reference Manual for definition
SNOw   - REAL Variable (Input) - Percentage snow (%)
ICE    - REAL Variable (Input) - Percentage ice (%)
WATER  - REAL Variable (Input) - Percentage water (%)

PARAMETER Declarations:

INTEGER          NMATL, NSCEN, NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT,
                  MAXLON, ISMX, NVSMAX, NL, MOLMAX
PARAMETER        (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER        (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER        (MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER        (NMATL=28, NSCEN=35, NL=50)

INTRINSIC and EXTERNAL Declarations:

EXTERNAL         BRGDBD, SCENBD, MODBCK, INTR2D, ATMSBD

Local Variable Declarations:

INTEGER          I, ISTORE, KK, LL
REAL             FRCTN, TAIRFP, PTFAC (MAXLAT, MAXLON)

COMMON Blocks:   /ATMDAT/, /BACKGD/, /HEADER/, /SCENES/

SUBROUTINE SETFLG

Argument Declarations:

ISOLAR - INTEGER Variable (Input) - Solar index
ILUNAR - INTEGER Variable (Input) - Lunar index
IEPHEM - INTEGER Variable (Input) - Ephemeris index
ISMPLS - INTEGER Variable (Input) - Type of solar calculation
ISMPLL  - INTEGER Variable (Input) - Type of lunar calculation
IVSA    - INTEGER Variable (Input) - Vertical structure index
IFATM   - INTEGER Variable (Input) - Atmosphere file number
IFBCK   - INTEGER Variable (Input) - Background file number
IFBSW   - INTEGER Variable (Input) - Fore/Background altitude switch
IGMSW   - INTEGER Variable (Input) - Geometry type index
IFMSC   - INTEGER Variable (Input) - Multiple scattering index

PARAMETER Declarations:

INTEGER          NGMAX
PARAMETER        (NGMAX=15)

Local Variable Declarations:

INTEGER          I

COMMON Blocks:   /FLAGS/
SUBROUTINE SETUP

Argument Declarations:

L1    - INTEGER Variable (Output) - Location of start of ray in altitude array
LSH   - INTEGER Variable (Output) - Location of termination of ray in altitude array
PHISHR - DOUBLE PRECISION Variable (Output) - Initial elevation angle for ray (rad)
ITERM - INTEGER Variable (Output) - Terminator index
        Refer to User Reference Manual for definition
LBKGD - INTEGER Variable (Input) - Location of background altitude in altitude array
LTRGT - INTEGER Variable (Input) - Location of target altitude in altitude array
PHISH - REAL Variable (Input) - Initial elevation angle for ray (deg)
PHIHor - REAL Variable (Input) - Elevation angle to horizon (deg)
IBKGD - INTEGER Variable (Input) - Background index
        Refer to User Reference Manual for definition
ML    - INTEGER Variable (Input) - Number of altitudes in altitude array

INTRINSIC and EXTERNAL Declarations:

        INTRINSIC DBLE
COMMON Blocks:        /CONSTN/

REAL FUNCTION SHADOW

Argument Declarations:

PHI1   - REAL Variable - Incident elevation angle (deg)
PHI2   - REAL Variable - Reflected elevation angle (deg)
THETA  - REAL Variable - Azimuth (deg)
SLOPE  - REAL Variable - Mean slope of the roughness

INTRINSIC and EXTERNAL Declarations:

        DOUBLE PRECISION DERF
        INTRINSIC SQRT, EXP, COS, SIN, ABS, REAL, DBLE, MOD, MAX
        EXTERNAL DERF

Local Variable Declarations:

        DOUBLE PRECISION A1, A2, B1, B2, X1, X2, SLOPE1, SLOPE2, DUM, THETP, DUMM

COMMON Blocks:        /CONSTN/

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SUBROUTINE SHNGEO

Argument Declarations:

SRC - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Vector to sun/moon from earth center
SCTPT - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Vector to scattering point from earth center
ELEV - REAL Variable (Input) - Elevation angle of ray at scattering point (deg)
AZIM - REAL Variable (Input) - Azimuth angle of ray at scattering point (deg)
XLAT - REAL Variable (Input) - Latitude of scattering point (deg)
XLON - REAL Variable (Input) - Longitude of scattering point (deg)
Izl - INTEGER Variable (Input) - Altitude index of scattering point
LSRC - INTEGER Variable (Input) - Altitude index of sun/moon
SCTANG - REAL Variable (Output) - Scattering angle (deg)
NDXSR - INTEGER Variable (Input) - Index for starting position of a given ray in the IZLSH and DRZLSH vectors
NTBSR - INTEGER Variable (Output) - Number of elements in the IZLSH and DRZLSH vectors for each ray
IZLSH - INTEGER Vector (Len = Unspecified) (Output) - Altitude indices for the ray
DRZLSH - REAL Vector (Len = Unspecified) (Output) - Path length segments for the ray (km)
ISTMAX - INTEGER Variable (Input) - Dimension of IZLSH and DRZLSH
SRCERV - REAL Variable (Output) - Elevation angle of source at the background (deg)
IAZREF - INTEGER Variable (Input) - Azimuth reference index
SOLAZ - REAL Variable (Input) - Solar azimuth (deg)
SOLFAC - REAL Array (Dim = MAXLAT x MAXLON x Unspecified) (Output) - Proportionality factor for the ray
IBKGD - INTEGER Variable (Input) - Background index
NLAT - INTEGER Variable (Input) - Number of latitudes
NLON - INTEGER Variable (Input) - Number of longitudes
ISWATM - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) - Switch for model atmospheres
NSOLFC - INTEGER Array (Dim = 2 x Unspecified) (Input/Output) - Array limits for non-zero values of SOLFAC

PARAMETER Declarations:

INTEGER MLMAX, MLMAX2, ISMX, MAXLAT, MAXLON, NGMAX, NL, MOLMAX
PARAMETER (MLMAX=140, MLMAX2=2*MOLMAX)
PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15, NL=50)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC COS, SIN, REAL, DBLE, SQRT, ACOS, ASIN, MAX, MIN
EXTERNAL RAYTH, HOREQU, SPTRIG, INTR2D, ATMSBD

Local Variable Declarations:

INTEGER I, L1, L2, LT, LTM, MLP, ISRC, LENS, ITDUM(MLMAX2), KK, LL
REAL R(MLMAX2), PHI(MLMAX2), THETA(MLMAX2), ALPHA, DELTA,
     XLOS(3), AZP, PTHLAT, PTHLON, BETA, HTNGT
DOUBLE PRECISION SOLE, DRX, RX, SNSEL, CSSCAT, DSC

COMMON Blocks: /ATMDAT/,,/CONSTN/,,/INITIAL/
SUBROUTINE SKYNIOI

Argument Declarations:

* Z - REAL Variable (Input) - Altitude (km)
P - REAL Variable (Input) - Pressure at Z (mb)
T - REAL Variable (Input) - Temperature at Z (K)
CMOL - REAL Vector (Len = Unspecified) (Input) - Molecular concentrations at Z (ppm)
* ZM - REAL Variable (Input) - Altitude just below Z (km)
PM - REAL Variable (Input) - Pressure at ZM (mb)
TM - REAL Variable (Input) - Temperature at ZM (K)
CMOLM - REAL Vector (Len = Unspecified) (Input) - Molecular concentrations at ZM (ppm)
ZP - REAL Variable (Input) - Altitude just above Z (km)
P P - REAL Variable (Input) - Pressure at ZP (mb)
TP - REAL Variable (Input) - Temperature at ZP (K)
CMOLP - REAL Vector (Len = Unspecified) (Input) - Molecular concentrations at ZP (ppm)
CN2 - REAL Variable (Input) - Refractivity structure constant (m^{-2/3})
CT2 - REAL Variable (Output) - Temperature structure constant (K^2/m^{2/3})
CSM2 - REAL Variable (Output) - Molecular scatter structure constant divided by the molecular scatter coefficient squared (m^{3/2})
CSA2 - REAL Variable (Output) - Aerosol scatter structure constant divided by the aerosol scatter coefficient squared (m^{2/3})
XL0 - REAL Variable (Output) - Turbulence scale length (m)
SKYFAC - REAL Vector (Len = Unspecified) (Output) - Factor used in evaluating sky noise
  1 - Thermal sky noise
  2 - Molecular scatter
  3 - Aerosol scatter
HB - REAL Variable (Input) - Terrain altitude (km)

INTRINSIC and EXTERNAL Declarations:

DOUBLE PRECISION REFRAC
INTRINSIC MAX, ABS, LOG, SQRT, REAL
EXTERNAL REFRAC

Local Variable Declarations:

INTEGER K
REAL DNDT, DNDP, DZ, DZ1, DZ2, DTDZ, DPDZ, DQDZ, DNDQDZ,
 DNDHDZ, DNDQ (3), DT, DSDMN, DSADN

DOUBLE PRECISION AN, XN1, XN2

COMMON Blocks: /CONSTN/

*
REAL FUNCTION SLPOS

Argument Declarations:

XLAT0 - REAL Variable - Reference latitude (in degrees and fractions of degrees, is north)
XLONG0 - REAL Variable - Reference longitude (in degrees and fractions of degrees, is east)
XLAT - REAL Variable - Latitude (in degrees and fractions of degrees, is north)
XLONG - REAL Variable - Longitude (in degrees and fractions of degrees, is east)
SOLEV - REAL Variable - Default (geometric) value of solar elevation (deg)
LBKGD - INTEGER Variable - Background altitude index
LSOLAR - INTEGER Variable - Solar/lunar altitude index
NLAT - INTEGER Variable - Number of latitudes
NLONG - INTEGER Variable - Number of longitudes

PARAMETER Declarations:

INTEGER MLMAX, MLMAX2
PARAMETER (MLMAX=140, MLMAX2=2*MLMAX)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC COS, ACOS, SIN, REAL, DBLE
EXTERNAL HORIZN, GEOM

Local Variable Declarations:

INTEGER IZ(MLMAX2), LENP, IBKGD, IERR, KL, ITPGM, IPRINT,
       LBKGD0, LSOLR0, MLAT, MLON
REAL SRRS, BETAS, PHI1, PHI2, SRMAX, BETMAX, RHOS, BHOS,
     PHOS, R(MLMAX2), PHI(MLMAX2), THETA(MLMAX2),
     HTNQ, HSEND

COMMON Blocks: /CONSTN/

REAL FUNCTION SLRCON

Argument Declarations:

SOLDIS - REAL Variable - Normalized solar distance

INTRINSIC and EXTERNAL Declarations:

CXX REAL SOLAR
CXX INTRINSIC REAL, DPROD
CXX EXTERNAL SOLAR
EXTERNAL SOLRBD

Local Variable Declarations:

CXX INTEGER I
REAL V, DV, DUM
CXX DOUBLE PRECISION SUM

COMMON Blocks: /SOLIR1/
REAL FUNCTION SLUNAR

Argument Declarations:

V      - REAL Variable - Wavenumber (cm⁻¹)
DV     - REAL Variable - Wavenumber increment (cm⁻¹)
PHLUNR - REAL Variable - Phase of the moon (deg)
SOLDIS - REAL Variable - Normalized solar distance
         SOLDIS = 1.0 implies a solar constant of 1353 W/m²
XLUNDS - REAL Variable - Normalized lunar distance

PARAMETER Declarations:

INTEGER   NEL,NALB
PARAMETER (NALB=30, NEL=37)

INTRINSIC and EXTERNAL Declarations:

REAL       XTERP,SOLAR
INTRINSIC  COS,SIN
EXTERNAL   XTERP,SOLAR

Local Variable Declarations:

INTEGER   ITRP0
REAL      ALBED(NALB),WLL(NALB),CORREC(NEL),ELONG(NEL),
          THETA,Sphere,ERTHMN,RMOON,WL

COMMON Blocks: /CONSTN/

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SUBROUTINE S MPCAL

Argument Declarations:

ML - INTEGER Variable (Input) - Number of lines-of-sight
MLMX2 - INTEGER Variable (Input) - Maximum DIMENSION of several arrays
NL - INTEGER Vector (Len = Unspecified) (Input) - Number of altitude layers for each line-of-sight
ITL - INTEGER Array (Dim = MLMX2 x Unspecified) (Input) - Altitude index of each path
DRL - REAL Array (Dim = MLMX2 x Unspecified) (Input) - Path increments of each path length (km)
SOLFAC - REAL Array (Dim = MAXLAT x MAXLON x MLMX2 x Unspecified) (Input) - Proportionality factor for multiple atmospheres
NSOLFC - INTEGER Array (Dim = 2 x 2 x Unspecified) (Input) - Limits for the non-zero elements of SOLFAC
RADINT - REAL Variable (Input) - Initial (exoatmospheric) irradiance (W/cm^2/cm^2)
RADSMP - REAL Vector (Len = Unspecified) (Output) - Irradiance at the various altitudes (W/cm^2/cm^2)
DV - REAL Variable (Input) - Wavenumber increment (cm^-1)

PARAMETER Declarations:

INTEGER MLMAX, ISMX, MAXLAT, MAXLON, MOLMAX
PARAMETER (MLMAX=140, MAXLAT=3, MAXLON=1)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL
EXTERNAL PHTHTAU

Local Variable Declarations:

INTEGER K, L, KL, ITYPE, ISTORE, MM1
REAL $1(ISMX), S2(ISMX), S3(ISMX), S4(ISMX), S5(ISMX), S6(ISMX), TAU12
DOUBLE PRECISION XS(ISMX), TAUL(MLMAX), TAULA(MLMAX)
LOGICAL FLTRN

COMMON Blocks: None
REAL FUNCTION SNOWEX

Argument Declarations:

SRATE - REAL Variable - Snow rate, expressed in terms of water content (mm/hr)
TEMP - REAL Variable - Temperature (K)
ITYPE - INTEGER Variable - Type of snow
   ITYPE = 0 implies no snow
   ITYPE = 1 implies needle crystals
   ITYPE = 2 implies plain dendritic crystals
   ITYPE = 3 implies spatial dendritic crystals
   ITYPE = 4 implies powder snow
   ITYPE = 5 implies crystal with droplet
   ITYPE = 6 implies graupel

PARAMETER Declarations:

INTEGER NBIN
PARAMETER (NBIN=21)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, MIN, INT, REAL, SQRT, ABS, EXP
EXTERNAL SNOWBD

Local Variable Declarations:

INTEGER I, ITMP, ITMP1, ICRYS
REAL XTMP, FACTMP, RHOW, QEXT, DUM, R32, DREFF, R, DCRYS,
   VOL, AREA, ARTOT, VOLTOT, RC, ALPHA, GAMMA, FRAD, VEL

COMMON Blocks: /CONSTN/, /SNWDAT/

SUBROUTINE SNOWSP

Argument Declarations:

WL - REAL Variable (Input) - Wavelength (μm)
TEMP - REAL Variable (Input) - Temperature (K)
ISNOW - INTEGER Variable (Input) - Snow index
SNABS - REAL Variable (Output) - Normalized absorption coefficient
SNSCT - REAL Variable (Output) - Normalized scattering coefficient

PARAMETER Declarations:

INTEGER NWLCLD
PARAMETER (NWLCLD=79)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MIN
EXTERNAL PROFAC, RAINBD

Local Variable Declarations:

INTEGER KEYWL, KEYWLP, KTP, KTTP
REAL FACWL, DUM1, DUM2, FACTP

COMMON Blocks: /RAINWNL/

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SUBROUTINE SOIL

Argument Declarations:

WATER - COMPLEX Variable (Input) - Dielectric constant of water
ICE - COMPLEX Variable (Input) - Dielectric constant of ice
MV - REAL Variable (Input) - Volumetric moisture in vegetation
EM - COMPLEX Variable (Output) - Mean dielectric constant of soil
DEL - REAL Variable (Output) - Standard deviation of the dielectric constant of soil

INTRINSIC and EXTERNAL Declarations:

INTRINSIC          ABS,CMPLX
EXTERNAL           EMISBD

Local Variable Declarations:

REAL            WP,GAM,WT,SAND,CLAY,P
COMPLEX          EX,AIR,ROCK

COMMON Blocks: None

REAL FUNCTION SOLAR

Argument Declarations:

V       - REAL Variable - Wavenumber (cm⁻¹)
DV      - REAL Variable - Wavenumber increment over which irradiance is averaged (cm⁻¹)
SOLDIS  - REAL Variable - Solar distance (in terms of mean distance)

INTRINSIC and EXTERNAL Declarations:

LOGICAL       EVEN
INTRINSIC     REAL,INT,MOD
EXTERNAL       SLR1BD,SLR2BD,SLR3BD,SLR4BD,SLR5BD,EVEN

Local Variable Declarations:

INTEGER      I,IV,IDV,IP
REAL          P,VL0,V0,VP,WT,DVREF
LOGICAL       EVN

COMMON Blocks: /SOLIR1//SOLIR2//SOLIR3//SOLIR4//SOLIR5//
SUBROUTINE SOLBND

Argument Declarations:

- Z - REAL Vector (Len = Unspecified) (Input) - Altitude (m) vs. pressure (10 mb increment) array
- FUO - REAL Variable (Input) - Exo-atmospheric solar flux times UO
- UO - REAL Variable (Input) - Cosine of solar zenith angle
- UD - REAL Vector (Len = Unspecified) (Output) - Upward diffuse shortwave flux (W/m²) at each layer boundary
- DD - REAL Vector (Len = Unspecified) (Output) - Downward diffuse shortwave flux (W/m²) at each layer boundary
- SD - REAL Vector (Len = Unspecified) (Output) - Downward beam shortwave flux (W/m²) at each layer boundary
- ALBS - REAL Variable (Input) - Solar band diffuse reflectance
- CLDP - REAL Vector (Len = Unspecified) (Input) - Cloud cover (%)
  1 - Low etage
  2 - Middle etage
  3 - High etage

INTRINSIC and EXTERNAL Declarations:

- REAL BBO3
- INTRINSIC ABS, SQRT, EXP
- EXTERNAL BBO3, BRBNBD, SRAT, CLDLR, SRTRAY, SPROD, SWAT

Local Variable Declarations:

- INTEGER I, J, IB, IK
- REAL R(9), T(9), US(9), DS(9), X(9), S(9), TRY(9), AMAG(9), UP(9), UDB(10), DDB(10), SDB(10), G0, UOO, UOT, SO, B, BU, CLA, OMC, TAU, G, TAUB, WO, WOB, TT, TC, TCB, WC, WCB, DCL, TCL, UCL, A, DTCS, DTUB, TS

COMMON Blocks: /INITL/, /OMATLM/, /SWPARM/
SUBROUTINE SOLRAD

Argument Declarations:

TAUL - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Transmittances at each point along path (i.e., an incremental set of transmittance)
L - INTEGER Variable (Input) - Layer index at which calculations are to be made
KL - INTEGER Variable (Input) - Altitude index at which calculations are to be made
SOLXM - REAL Variable (Output) - Apparent solar irradiance as a function of azimuth (W/cm²/cm²)
RDSOLR - REAL Variable (Input/Output) - Running integral along path of scattered solar and lunar radiation (W/cm²/cm²)
RDSVAR - REAL Variable (Input/Output) - Running integral along path of variance scattered solar and lunar radiation ((W/cm²/cm²)²)
XS - DOUBLE PRECISION Vector (Len = Unspecified) (Input/Output) - Optical depth
S1 - REAL Vector (Len = Unspecified) (Input/Output) - Summing variable for Lorentz halfwidth times line density
S2 - REAL Vector (Len = Unspecified) (Input/Output) - Summing variable for Doppler halfwidth times line density
S3 - REAL Vector (Len = Unspecified) (Input/Output) - Summing variable for line density
S4 - REAL Vector (Len = Unspecified) (Input/Output) - Summing variable for the continuum
S5 - REAL Vector (Len = Unspecified) (Input/Output) - Summing variable for scattering
S6 - REAL Vector (Len = Unspecified) (Input/Output) - Summing variable for (Lorentz halfwidth)² times line density
ANGLE - REAL Vector (Len = Unspecified) (Input) - Array of scattering angles (deg)
SCATTR - REAL Array (Dim = NANG x MAXLAT x Unspecified) (Input) - Angle dependent scattering parameters, including the phase function and albedo (sr²)
SCTVAR - REAL Array (Dim = NANG x MAXLAT x Unspecified) (Input) - Angle dependent variance of the scattering parameters, including the phase function and albedo (sr²²)
NANG - INTEGER Variable (Input) - First DIMENSION of ANGLE, SCATTR, and SCTVAR
SOLX - REAL Variable (Input) - Exoatmospheric spectral solar irradiance (W/cm²/cm²)
NSL - INTEGER Variable (Input) - Number of layers in solar path
ISL - INTEGER Vector (Len = Unspecified) (Input) - Altitude indices for the solar paths
DRSL - REAL Vector (Len = Unspecified) (Input) - Path length increments for the paths (km)
SCTANG - REAL Variable (Input) - Solar scattering angels (deg)
SOLYR - REAL Array (Dim = MLMX2 x MAXLAT x Unspecified) (Input) - Solar irradiance at each altitude (W/cm²/cm²)
NDXL - INTEGER Variable (Input) - Index providing the starting point the ISL and DRSL arrays for the appropriate paths
FLSLR - LOGICAL Variable (Input) - Switch for solar calculations.
FLSMP - LOGICAL Variable (Input) - Switch for type of calculations.
LP - INTEGER Variable (Input/Output) - Secondary altitude index
SCT1 - DOUBLE PRECISION Variable (Input/Output) - Scattering term storage
SCT2 - DOUBLE PRECISION Variable (Input/Output) - Scattering variance storage
DRKM - REAL Variable (Input) - Incremental ranges along solar scattered path (km)
PPTHFAC - REAL Array (Dim = MAXLAT x MAXLON x Unspecified) (Input) - Proportionality factor for the multiple atmospheres
NPPTH - INTEGER Array (Dim = 2 x Unspecified) (Input) - Limits for non-zero elements of PPTHFAC
DV - REAL Variable (Input) - Wavenumber increment (cm⁻¹)

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PARAMETER Declarations:

INTEGER
PARAMETER
(MLMAX=140, MLMX2=2*MLMAX, MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP, RADTRY
INTRINSIC REAL, DPROD, DBLE
EXTERNAL PTHTAU, XTERP, RADTRY

Local Variable Declarations:

INTEGER KK, LL, MM1, ITRP1, ITYPE, ISTORE
REAL SCTDM2, SCTDM4, TAUSLR
DOUBLE PRECISION TAUX(MLMX2), TAUXA(MLMX2), SCT2, SCT4, DELTAU, DDRKM
LOGICAL FLTRN

COMMON Blocks: None
SUBROUTINE SPCLYR

Argument Declarations:

TSRF - REAL Variable (Input) - Initial surface temperature (K)
TSSL - REAL Variable (Input) - Initial sub-surface temperature (K)
MT - INTEGER Variable (Input) - Material index
TLAYER - REAL Vector (Len = 0:Unspecified) (Input/Output) - T
Temperatures in conducting subsurface (K)
ZLAYER - REAL Vector (Len = 0:Unspecified) (Input/Output) - Layer depth (m)
NLAYER - INTEGER Variable (Input) - Number of layers
SPHLRY - REAL Vector (Len = 0:Unspecified) (Output) - Specific heat
at each layer (W-sec/gm/K)
DENLYR - REAL Vector (Len = 0:Unspecified) (Output) - Density
at each layer (gm/m^3)
HTCLYR - REAL Vector (Len = 0:Unspecified) (Output) - Conductance
coefficient at each layer (W/m^2/K)
FLINI - LOGICAL Variable (Input) - Initialization flag
PRESS - REAL Variable (Input) - Atmospheric pressure (mb)
CMOL - REAL Vector (Len = 0:Unspecified) (Input) - Atmospheric
molecular concentrations (ppmv)

PARAMETER Declarations:

INTEGER NMATL, MAXLAT, MAXLON
PARAMETER (NMATL=28, MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

REAL THCICE, THCSNW, SPHICE, DENWTR, THCWTR, SPHWTR,
DENAIR, THCAIR, SPHAIR
INTRINSIC MAX, MIN, SQRT, EXP, REAL, COS
EXTERNAL THCICE, THCSNW, SPHICE, DENWTR, THCWTR, SPHWTR,
BKGDBD, DENAIR, THCAIR, SPHAIR

Local Variable Declarations:

INTEGER K, L
REAL PERIOD, DAMPD, DZ

COMMON Blocks: /BACKGD/

REAL FUNCTION SPHAIR

Argument Declarations:

CH2O - REAL Variable - Water vapor content (ppmV)

INTRINSIC and EXTERNAL Declarations: None

Local Variable Declarations: None

COMMON Blocks: None
REAL FUNCTION SPHICE

Argument Declarations:

TEMP  - REAL Variable - Temperature (K)

PARAMETER Declarations:

INTEGER       NSPH
PARAMETER     (NSPH=11)

INTRINSIC and EXTERNAL Declarations:

REAL            XTERP
EXTERNAL        XTERP

Local Variable Declarations:

INTEGER        ITRP0
REAL           T(NSPH), SPH(NSPH), TC

COMMON Blocks: None

REAL FUNCTION SPHWTR

Argument Declarations:

TEMP  - REAL Variable - Temperature (K)

PARAMETER Declarations:

INTEGER       NSPH
PARAMETER     (NSPH=19)

INTRINSIC and EXTERNAL Declarations:

REAL            XTERP
EXTERNAL        XTERP

Local Variable Declarations:

INTEGER        ITRP0
REAL           T(NSPH), SPH(NSPH), TC

COMMON Blocks: None
SUBROUTINE SPROD

Argument Declarations:

SO - REAL Variable (Input) - Incident solar flux times cosine zenith angle (W/m²)
UO - REAL Variable (Input) - Cosine zenith angle
TAU - REAL Variable (Input) - Optical depth
W - REAL Variable (Input) - Single scattering albedo
B - REAL Variable (Input) - Hemisphere average backscattering fraction
BU - REAL Variable (Input) - Zenith angle dependent backscattering fraction
R - REAL Variable (Input) - Diffuse reflection coefficient
T - REAL Variable (Input) - Diffuse transmission coefficient
U - REAL Variable (Output) - Upward diffuse flux (W/m²) scattered from the solar beam
D - REAL Variable (Output) - Downward diffuse flux (W/m²) scattered from the solar beam
CLA - REAL Variable (Input) - Cloud fraction

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, EXP, DBLE, DPROD

Local Variable Declarations:

DOUBLE PRECISION DWM, A, E, G, DD, SS

COMMON Blocks: None

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SUBROUTINE SPTRIG

Argument Declarations:

XLAT - REAL Variable (Output) - Final latitude (deg.)
XLO - REAL Variable (Output) - Final longitude (deg.)
XLATI - REAL Variable (Input) - Initial latitude (deg.)
XLONI - REAL Variable (Input) - Initial longitude (deg.)
AZIM - REAL Variable (Input) - Azimuth of angular distance measured at initial point. 0.0 implies North, 90.0 implies East. (deg.)
BETA - REAL Variable (Input) - Angular extent of distance measured from the center of the earth (deg)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, ATAN2, ASIN, SIN, COS, ACOS, DBLE

Local Variable Declarations:

DOUBLE PRECISION DUMX, DUMY, AZIMP, DLON, DBETA

COMMON Blocks: /CONSTM/
SUBROUTINE SRAT

Argument Declarations:

UO - REAL Variable (Input) - Cosine of plane parallel solar zenith angle
I  - INTEGER Variable (Input) - Index of layer (1 - top to 9 - bottom)
Z  - REAL Vector (Len = Unspecified) (Input) - Array of
    altitudes (m) vs. pressure (10 mb)
UP - REAL Variable (Output) - Modified cosine of solar zenith
    angle for a spherical geometry
UOT - REAL Variable (Output) - Modified cosine of solar zenith
     angle at the next layer for a spherical correction

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SIN, COS, ASIN,acos, SQRT, REAL, DBLE, ABS

Local Variable Declarations:

REAL RZ, DZ
DOUBLE PRECISION TO, TP, RE, R, RDZ

COMMON Blocks: /CLIMAT/

SUBROUTINE SRCFLX

Argument Declarations:

PTHFAC - REAL Array (Dim = MXLAT x MXLON x MLMX2 x Unspecified) -
    Proportionality factor at source
NPTH  - INTEGER Array (Dim = 2 x 2 x Unspecified) - Limits of non-zero
    values of PTHFAC
MXLAT - INTEGER Variable (Input) - Maximum number of latitudes
MXLON - INTEGER Variable (Input) - Maximum number of longitudes
MLMX2 - INTEGER Variable (Input) - Maximum number of path segments
NSRC - INTEGER Variable (Input) - Source index for path segments
IGEOM - INTEGER Variable (Input) - Geometry number
MTIME - INTEGER Variable (Input) - Number of temporal values

PARAMETER Declarations:

INTEGER NGMAX, NAZMAX, NASMAX, NZSMAX, NTIME, MAXLAT, MAXLON,
       NVSMAX, ISMX, MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (NTIME=97)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, INT

Local Variable Declarations:

INTEGER L, LEVD, LEVU, IT, ITM, MM, KK, LL
REAL FAC, FACT

COMMON Blocks: /BRBDT/, /HEADER/
SUBROUTINE SRGEO

Argument Declarations:

NSRC - INTEGER Vector (Len = Unspecified) (Output) - Number of points in altitude-source path
ITSRC - INTEGER Array (Len = MLMX2 x Unspecified) (Output) - Index of altitude grid points for background-source path for simple calculations
DRSRC - REAL Array (Len = MLMX2 x Unspecified) (Output) - Path length segments for background-source path for simple calculations (km)
PHIL - REAL Variable (Output) - Elevation angles along simple path (deg)
LSRC - INTEGER Variable (Input) - Source altitude index
XLAT - REAL Variable (Input) - Latitude (deg)
XLOM - REAL Variable (Input) - Longitude (deg)
SOLFC - REAL Array (Dim = MAXLAT x MAXLON x MLMX2 x Unspecified) (Output) - Proportionality factor for background-source path for simple calculations
NLAT - INTEGER Variable (Input) - Number of latitudes
NLON - INTEGER Variable (Input) - Number of longitudes
ISWATM - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) - Switch for model atmospheres
NSOLFC - INTEGER Array (Dim = 2 x 2 x Unspecified) (Input/Output) - Array limits for non-zero values of SOLFAC
XLATSR - REAL Variable (Input) - Source latitude (deg)
XLONGSR - REAL Variable (Input) - Source longitude (deg)

PARAMETER Declarations:

INTEGER MLMAX, MLMX2, NAZMAX, ISMX, MAXLAT, MAXLON, NGMAX, NL, MOLMAX
PARAMETER (MLMAX=140, MLMX2=2*MLMAX, NAZMAX=30)
PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15, NL=50)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, COS, SIN, MAX, MIN, DBLE
EXTERNAL GEOM, SPTRIG, INTR2D, ATMSBD, HORIZN

Local Variable Declarations:

INTEGER ITDUM(MLMX2), LS, LSX, LSP, L1, L2, L, ISRC, LENS, MM, KL, KK, LL
REAL R(MLMX2), PHI(MLMX2), THETA(MLMX2), HMIN, BETA, AZP, XLAT, XLONP, ELEV, PTHLAT, PTHLON, DTDPAV, SOLAZP
DOUBLE PRECISION SOLE, SRC(3), SCTP(3)

COMMON Blocks: /ATMDAT/, /CONSTN/, /INITIAL/
SUBROUTINE SRCIRR

Argument Declarations:

IFSCR - INTEGER Variable (Input/Output) - File number for scratch file for solar path data
         If IFSCR = 0, file is not OPENed.
ISHINE - INTEGER Variable (Input) - Sky/earthshine index
         Refer to User Reference Manual for definition.
IGEOM - INTEGER Variable (Input) - Geometry index
ISWATM - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) -
         Switch for model atmospheres

PARAMETER Declarations:

INTEGER
   MLMAX, MLMX2, ISMX, ISTMAX, NAZMAX, NASMAX, NGMAX,
   NZSMAX, MAXLAT, MAXLON, NVSMAX, NL, MOLMAX
PARAMETER
   (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER
   (MLMAX=140, MLMX2=2*MLMAX)
PARAMETER
   (MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER
   (ISTMAX=30000)
PARAMETER
   (MAXLAT=3, MAXLON=1, NVSMAX=20, NL=50)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72   IOERR
INTRINSIC      MAX, SIN, COS, MIN, DBLE
EXTERNAL       RAYPTH, CALEND, HOREQU, EQUECL, ECLGAL, SETUP, IOERR,
               ASPECT, SHNGEO, INDBXK, SPTRIG, HORIZN, INTR2D,
               ATMSBD

Local Variable Declarations:

INTEGER
   I, L, L1, LM, LSH, M, MM, IDAYX, LENS, KK, LL, IOS, KL, IERR
   R(MLMX2), THETA(MLMX2), ELEV, BETA, DYEAR, XLEQUT,
   BEQUT, PHIHOR, THD, XLATP, XLONP, TAIRP,
   CLDCVP(0:3), TMIDN, TNOON, A2P, SOLA2P, SRMAX,
   BETMAX, RHRT, BHRT, HTNGT
REAL
   DOUBLE PRECISION
   PHISHR, SOL(3), XLN(3), SCTPT(3)

COMMON Blocks:

   /ATMDAT/, /CONSTN/, /FLAGS/ ,/HEADER/, /INITIAL/, /PATH2/, /PATH2A/, /PATH2B/, /PATH2C/, /PATH2D/, /PATH4/
SUBROUTINE SRFLUX

Argument Declarations:

RFDS - REAL Variable (Input) - Direct solar flux (W/m²)
DSW - REAL Variable (Input) - Downward short-wave flux (W/m²)
DLW - REAL Variable (Input) - Downward long-wave flux (W/m²)
ABSSLR - REAL Variable (Input) - Solar absorptivity
EMSTRM - REAL Variable (Input) - Thermal emissivity
HTCOND - REAL Variable (Input) - Conductance coefficient (W/m²/K)
CHARLN - REAL Variable (Input) - Surface characteristic length (m)
TAR - REAL Variable (Input) - Air temperature (K)
PRESS - REAL Variable (Input) - Air pressure (mb)
WIN - REAL Variable (Input) - Wind speed (m/sec)
TLAYER - REAL Vector (Len = 0:Unspecified) (Input) - Temperatures in each layer (K)
ZLAYER - REAL Vector (Len = 0:Unspecified) (Input) - Layer depth (m)
H - REAL Variable (Input) - Effective depth of heat storage (m)
IHTFLG - INTEGER Variable (Input) - Heat calculation index
       IHTFLG = 0 implies no heat calculations
       IHTFLG = 1 implies heat calculations with evaporation
       IHTFLG = 2 implies heat calculations without evaporation
A - REAL Variable (Output) - Coefficient for the T⁴ term
B - REAL Variable (Output) - Coefficient for the T term
C - REAL Variable (Output) - Coefficient for the constant term

INTRINSIC and EXTERNAL Declarations:

REAL EVAPOR,SATUR
INTRINSIC ABS
EXTERNAL EVAPOR,SATUR

Local Variable Declarations:

INTEGER ITYPE
REAL SIGMA,C,P,GAM,REC,P0,WAIR,WH2O,RATIO,
      TREF,XMU,DENS,T0,HCPORC,HCFREE,
      RLATEN,FLUXD,FLUXU,DT
CXX REAL FLUXD,FLUXU,RI,RO,RCONV,R2TDZ2,DTDZ1,DTDZ2

COMMON Blocks: None
SUBROUTINE SRTLAY

Argument Declarations:

R - REAL Variable (Output) - Spherical reflection coefficient
T - REAL Variable (Output) - Spherical transmission coefficient
G - REAL Variable (Input) - Asymmetry factor
W - REAL Variable (Input) - Scattering albedo
TAU - REAL Variable (Input) - Layer optical depth
RE - DOUBLE PRECISION Variable (Input) - Radius of the earth (km)
ZM - REAL Variable (Input) - Prior altitude (km)
Z - REAL Variable (Input) - Altitude of interest (km)
ZP - REAL Variable (Input) - Next altitude (km)

INTRINSIC and EXTERNAL Declarations:

REAL BETAU
INTRINSIC REAL
EXTERNAL DRTLAY, BETAU, GETGLC

Local Variable Declarations:

INTEGER I, N, INDX
REAL BU, RMU, RWT, RU, TU
DOUBLE PRECISION XMU(12), WT(12)

COMMON Blocks: /CONSTN/

REAL FUNCTION STARAD

Argument Declarations:

XL - REAL Variable - Galactic azimuth (deg)
B - REAL Variable - Galactic elevation (deg)
V - REAL Variable - Wavenumber (cm⁻¹)
DV - REAL Variable - Wavenumber increment (cm⁻¹)

INTRINSIC and EXTERNAL Declarations:

REAL PLANCK
INTRINSIC EXP, ABS
EXTERNAL PLANCK

Local Variable Declarations:

INTEGER I
REAL C0, C(2, 4), CP(2), T0, AL, PHI

COMMON Blocks: /CONSTN/
SUBROUTINE STGEOM

Argument Declarations:

STRING - CHARACTER*(*) Variable - Character string
HOBS - REAL Variable (Output) - Observer altitude (km)
HSRC - REAL Variable (Output) - Source altitude (km)
SLRNG - REAL Variable (Output) - Slant range (km)
BETA - REAL Variable (Output) - Earth center angle (deg)
PHIOBS - REAL Variable (Output) - Observer look angle (deg)
PHISRC - REAL Variable (Output) - Source look angle (deg)
LENP - INTEGER Variable (Output) - Length switch
0 - Short path
1 - Long path
VRDATA - CHARACTER*(*) Vector (Len = Unspecified) (Input) - Values to be read in.
ITPGM - INTEGER Variable (Output) - Calculation type
0 - At-Source
1 - S/B/C: Slant Range
2 - S/B/C: Earth Center angle
3 - S/B/C: Source Look Angle or L: Tangent Height
4 - S/B/C/L: Observer Look Angle
5 - S/B/C: Observer Look Angle with Slant Range
6 - S/B/C: Observer Look Angle with Earth Center Angle
7 - Horizontal: Range
8 - Horizontal: Earth Center Angle
9 - Limb: Tangent Latitude/Longitude
IGMSW - INTEGER Variable (Output) - Geometry label index
1 - At-Source
2 - Source (only)
3 - Background (only)
4 - Contrast (source and background)
5 - Limb path
6 - Horizontal path
IANGSW - INTEGER Variable (Output) - Angle label index
1 - Elevation angle
2 - Zenith angle
3 - Latitude and longitude

INTRINSIC and EXTERNAL Declarations:

INTEGER IGTINT
REAL GETVAR
CHARACTER*1 UPCASE,LWCASE
INTRINSIC ABS,REAL,DBLE
EXTERNAL GETVAR,IGTINT,UPCASE,LWCASE

Local Variable Declarations:

REAL ALTMAX
DOUBLE PRECISION RE

COMMON Blocks: /CONSTN/
REAL FUNCTION STRCN2

Argument Declarations:

Z – REAL Variable – Altitude (km)
HB – REAL Variable – Terrain altitude (km)
HTRPAU – REAL Variable – Tropopause altitude (km)
CN2SRF – REAL Variable – Surface value of Cn² (m⁻²/³)
WINDHI – REAL Variable – Average windspeed (m/sec)
PRESS – REAL Variable – Pressure (mb)
TEMP – REAL Variable – Temperature (K)
WH2O – REAL Variable – Water vapor concentration (ppm)
WCO2 – REAL Variable – Carbon dioxide concentration (ppm)
WO2 – REAL Variable – Oxygen concentration (ppm)
WL – REAL Variable – Wavelength (μm)

PARAMETER Declarations:

INTEGER MLMAX, NASMAX, ISMX, MOLMAX
PARAMETER (MLMAX=140, NASMAX=15)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
DOUBLE PRECISION REFRAC
INTRINSIC ABS, EXP, REAL
EXTERNAL XTERP, REFRAC

Local Variable Declarations:

INTEGER ITRP1
REAL WL0, ALT, ZP, ZTRPAU, ZINF, FAC, AVALLY, VV0, CN2BCK,
      WND, CN2X55, P1, T1, W1
DOUBLE PRECISION DNOXP, DNOXT, DNOXW1, XNOPT, XNW1, DNDN0, REARTH

COMMON Blocks: /CONSTN/, /USERDF/
SUBROUTINE SUMFIL

Argument Declarations:

FILERT - CHARACTER(*) Variable (Input) - File root name or file name
HEADNG - CHARACTER(*) Variable (Input) - Heading
TITLE - CHARACTER(*) Variable (Input) - Title

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX,
       NVSMAX, MOLMAX, MLIDMX
PARAMETER (NGMAX=15, NASMAX=30, NAZMAX=15, NZSMAX=4)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

INTEGER LENSTR
CHARACTER*72 IOERR
INTRINSIC INT, ABS, MAX, MIN, LEN, REAL
EXTERNAL CHRCBD, DEVCBD, PUTCLD, PUTSLR, CTIME, LENSTR, IOERR

Local Variable Declarations:

INTEGER I, K, LSTR, IHR, IMN, IOS, KA, KK, LL, ISEC, ITYPE
REAL YLAT, YLONG, SEC, XSEC, PHI, PH2
LOGICAL FLUSR
CHARACTER*1 GMTYPE(6), ANTYPE(3)
CHARACTER*3 TTIME(2), MONTH(12)
CHARACTER*4 LONG
CHARACTER*5 LAT

COMMON Blocks: /CHRCMN/, /DEVCMN/, /DEVICE/, /FLAGS/, /HEADER/,
                /MOLECP/, /USERNM/

REAL FUNCTION SUPK

Argument Declarations:

V - REAL Variable - Wavenumber (cm⁻¹)
V0 - REAL Variable - Center wavenumber (cm⁻¹)
C - REAL Variable -
N - INTEGER Variable -

INTRINSIC and EXTERNAL Declarations:

INTRINSIC ABS

Local Variable Declarations:

REAL XNORM, VM, X, TEN, XX, CXI

COMMON Blocks: /CONSTN/
SUBROUTINE SWAT

Argument Declarations:

RO - REAL Vector (Len = Unspecified) (Input) - Layer reflection functions
TO - REAL Vector (Len = Unspecified) (Input) - Layer transmission functions
US - REAL Vector (Len = Unspecified) (Input) - Layer up diff fluxes from solar beam
DS - REAL Vector (Len = Unspecified) (Input) - Layer down diff fluxes from solar beam
S  - REAL Vector (Len = Unspecified) (Input) - Depleted solar beam fluxes at layer boundaries
AB - REAL Variable (Input) - Solar band ground diffuse reflectance
UD - REAL Vector (Len = Unspecified) (Output) - Upward diffuse solar band fluxes at layer boundaries
DD - REAL Vector (Len = Unspecified) (Output) - Downward diffuse solar band fluxes at layer boundaries

INTRINSIC and EXTERNAL Declarations:

REAL GAM, RAB, RBE, DDIF, UDIF
EXTERNAL GAM, RAB, RBE, DDIF, UDIF

Local Variable Declarations:

REAL RA, RB, RC, RAS, RBS, RCS, TA, TB, TC, G, GA, GB, GC,
     RR1, RR2, R1, R2, RS, RS1, RS2, TT, US1, US2, DS1, DS2,
     DAS, DBS, DCS, DTS, UAS, UBS, UCS, UTS, DSA, DSB,
     USA, USB, RRS1, RRS2

COMMON Blocks: None
SUBROUTINE TANGPT

Argument Declarations:

R - REAL Vector (Len = Unspecified) (Input/Output) - Array of slant ranges along the ray (km)

PHI - REAL Vector (Len = Unspecified) (Input/Output) - Array of elevation angles along the ray (rad)

THETA - REAL Vector (Len = Unspecified) (Input/Output) - Array of earth center angles along the ray (rad)

IZ - INTEGER Vector (Len = Unspecified) (Input/Output) - Array of altitude indices along the ray

KL - INTEGER Variable (Input/Output) - Number of data points along the ray

HTNGT - REAL Variable (Input/Output) - Tangent altitude (km)

PARAMETER Declarations:

INTEGER MMLAX, ISMA, NNMAX, NA2MAX, NASMA, NGAS, NGMAX,
      NZSMAX, MAXLAT, MAXLAN, NVSMAX, NVSA, MOLMAX,
      MLIDMX
PARAMETER (NGMAX=15, NA2MAX=30, NASMA=15, NZSMAX=4)
PARAMETER (MLMAX=140, NNMAX=5, NGAS=6)
PARAMETER (MOLMAX=26, ISMA=MOLMAX+8, MLIDMX=45)
PARAMETER (MAXLAT=3, MAXLAN=1, NVSMAX=20, NVSA=9)

INTRANIC and EXTERNAL Declarations:

INTEGER ISTAEK
REAL STRCN2, XTERP, HAEK
INTRANIC REAL, DBLE, MAX, MIN, COS, SQRT, ABS
EXTERNAL STRCN2, XTERP, EQABS, ISTAEK, MOLPBD, AERSOL, HYDROM,
          HAEK, CLDRBD

Local Variable Declarations:

INTEGER I, L, LMN, ILZ, IZLP, MLP, ITRPAU(MAXLAT, MAXLAN), KK,
      LL, ISTPAU(MAXLAT, MAXLAN), KLOT, KON, IFPRINT,
      ITRP0, MLX
REAL WL, PHIL, PHI2, XMMSMN, DELLXH, FAC, VISX, VI, VP, DUM,
     TAV, FACICE, FACSNW, ZLP
DOUBLE PRECISION MH, SNEIL
LOGICAL DULPIC

COMMON Blocks: /CLDRN/, /HEADER/, /INITIAL/, /MOLCON/, /MOLECP/,
                /PLMDAT/, /VSADTA/
SUBROUTINE TERMPR

Argument Declarations:

SOLEV  - REAL Variable (Input) - Solar elevation (deg)
SOLAZ  - REAL Variable (Input) - Solar azimuth (deg)
XLUNEV - REAL Variable (Input) - Lunar elevation (deg)
XLUNAZ - REAL Variable (Input) - Lunar azimuth (deg)
PHI    - REAL Vector (Len = Unspecified) (Input) - Elevation angle background (deg)
PROJS  - REAL Array (Dim = 6 x Unspecified) (Output) - Solar projection factors
SHDWS  - REAL Vector (Len = Unspecified) (Output) - Self-shadowing factor for sun
PROJL  - REAL Array (Dim = 6 x Unspecified) (Output) - Lunar projection factors
SHDWL  - REAL Vector (Len = Unspecified) (Output) - Self-shadowing factor for moon
NPTS   - INTEGER Variable (Input) - Number of points
ISCN   - INTEGER Vector (Len = Unspecified) (Input) - Scene index

PARAMETER Declarations:

INTEGER             NGMAX, NSCEN, NMATL
PARAMETER           (NSCEN=35, NMATL=28)
PARAMETER           (NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

REAL                SHADOW
INTRINSIC           MAX, SIN, SQRT, ATAN2, ABS
EXTERNAL            SHADOW, SCENBD

Local Variable Declarations:

INTEGER             I, L, M, IBK
REAL                XNRM(6,3), XLST(3), SLOS(3), LLOS(3), PROJ1, PROJ2,
                    AZS, AZL, SLOPE

COMMON Blocks:      /CONSTN/, /FLAGS/, /SCENES/

REAL FUNCTION THCAIR

Argument Declarations:

TEMP    - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations: None

Local Variable Declarations: None

COMMON Blocks: None
REAL FUNCTION THCICE

Argument Declarations:

TEMP    - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL      XTERP
EXTERNAL   XTERP

Local Variable Declarations:

INTEGER   NT, ITRP0
REAL       T(11), THC(11), TC

COMMON Blocks: None

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REAL FUNCTION THCSNW

Argument Declarations:

DENSTY   - REAL Variable - Density (gm/m³)

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REAL FUNCTION THCWTR

Argument Declarations:

TEMP    - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL      XTERP
EXTERNAL   XTERP

Local Variable Declarations:

INTEGER   ITRP0, NT
REAL       T(11), THC(11), TC

COMMON Blocks: None
SUBROUTINE TITLCR

Argument Declarations:

   TITLE - CHARACTER(*) Variable (Output) - Title

INTRINSIC and EXTERNAL Declarations:

   CHARACTER*24  FDATE
   CVAX  INTRINSIC  TIME,DATE
   CIBM  INTRINSIC  REAL
   CRS6  INTRINSIC  TIME,LOCAL_DATE
   CF90  INTRINSIC  TIME_AND_DATE
   EXTERNAL  FDATE
   CPRI  EXTERNAL  TIMESA,DATESA
   CCDC  EXTERNAL  TIME,DATE
   CIBM  EXTERNAL  DATIMX
   CRS6  EXTERNAL  ADDARR
   CLAH  EXTERNAL  TIME,DATE

Local Variable Declarations:

   CIBM  INTEGER  NOW(14)
   CRS6  INTEGER  SNCEPH,TMADDR,TM(9)
   CIBM  REAL  SEC
   CIBM  CHARACTER*3  DAY(7),MONTH(12)
   CPRI  CHARACTER*8  BUFTP
   CVAX  CHARACTER*8  BUFTV
   CLAH  CHARACTER*8  BUFTL
   CF90  CHARACTER*8  BUFD90
   CVAX  CHARACTER*9  BUFDV
   CP90  CHARACTER*9  BUPT90
   CCDC  CHARACTER*10  BUFTC,BUFDC
   CCDC  CHARACTER*10  TIME,DATE
   CLAH  CHARACTER*11  BUFDL
   CPRI  CHARACTER*16  BUFDP
   CHARACTER*24  BUFDTU
   CRS6  CHARACTER*24  BUFRS6
   CIBM  CHARACTER*26  BUFIBM
   CHARACTER*40  BLANKS
   CHARACTER*49  MOSART

COMMON Blocks: None

CRS6  SUBROUTINE ADDARR

Argument Declarations:

   ADDRESS - INTEGER Vector (Len = N) (Input) - Address locations
   ARRAY - INTEGER Vector (Len = N) (Output) - Array containing address
   N - INTEGER Variable (Input) - Number of addresses

Local Variable Declarations:

   CRS6  IMPLICIT INTEGER (A-Z)

   CRS6  ARRAY(I)=ADDRESS(I)

COMMON Blocks: None

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REAL FUNCTION TMPCLD

Argument Declarations:

CLDRAD    - INTEGER Variable - Cloud radiance (\text{\textmu W/cm}^2\text{sr})

INTRINSIC and EXTERNAL Declarations:

INTRINSIC    LOG

Local Variable Declarations:

INTEGER      I
REAL          A(8), R

COMMON Blocks: None

SUBROUTINE TRANLW

Argument Declarations:

KDX        - INTEGER Variable (Input) - First index of element of matrix to be processed
JDX        - INTEGER Variable (Input) - Second index of element of matrix to be processed

INTRINSIC and EXTERNAL Declarations:

INTRINSIC    LOG10, MAX, EXP
EXTERNAL     BRBNBD

Local Variable Declarations:

INTEGER      I, J, M, IDXO(4), IDXT(4)
REAL          OP(4), TOP(4), D(4), T1(4), T2(4), O1(4), O2(4),
               EU, EV, EW, EX, OPD

COMMON Blocks: /FLXTAB/, /OMATLW/
SUBROUTINE TRNSMT

Argument Declarations:

TAU - DOUBLE PRECISION Variable (Output) - Transmission
TAUA - DOUBLE PRECISION Variable (Output) - Transmittance due to absorption
XS - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Optical depth
S1 - REAL Vector (Len = Unspecified) (Input) - Summing variable for Lorentz halfwidth times line density
S2 - REAL Vector (Len = Unspecified) (Input) - Summing variable for Doppler halfwidth times line density
S3 - REAL Vector (Len = Unspecified) (Input) - Summing variable for line density
S4 - REAL Vector (Len = Unspecified) (Input) - Summing variable for the continuum
S5 - REAL Vector (Len = Unspecified) (Input) - Summing variable for scattering
S6 - REAL Vector (Len = Unspecified) (Input) - Summing variable for (Lorentz halfwidth)^2 times line density
QA - REAL Vector (Len = Unspecified) (Input) - LOWTRAN exponential parameter
IBAND - INTEGER Vector (Len = Unspecified) (Input) - Band model index
ISPECS - INTEGER Variable (Input) - DIMENSION of XS, S1, S2, S3, S4, S5, S6, and QA
DV - REAL Variable (Input) - Spectral increment of transmittance calculations (cm^2)
FLAG - LOGICAL Variable (Input) - Flag for storing of component transmittances
MM - INTEGER Variable (Input) - Azimuth index

PARAMETER Declarations:

INTEGER ISMX, NAZMAX, MOLMAX
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, NAZMAX=30)

INTRINSIC and EXTERNAL Declarations:

DOUBLE PRECISION BAND
INTRINSIC DBLE, EXP, REAL
EXTERNAL BAND

Local Variable Declarations:

INTEGER K
DOUBLE PRECISION TAUSC, TAUP

COMMON Blocks: /TRANSP/
SUBROUTINE TURBUL

Argument Declarations:

NBKGD - INTEGER Variable (Input) - Number of path increments between observer and background

CN2 - REAL Array (Dim = MLMAX x MAXLAT x Unspecified) (Input) - Structure constant profile (m^-3/2)

RSCINT - REAL Vector (Len = Unspecified) (Input) - Path lengths for path between observer and background (km)

IOSB - REAL Vector (Len = Unspecified) (Input) - Altitude index for path increments between observer, source, and background in altitude array

PTHFAC - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Proportionality factor

NPTH - INTEGER Array (Dim = 2 x Unspecified) (Input) - Limits on non-zero components of PTHFAC

VARXZ - REAL Vector (Len = Unspecified) (Output) - Scintillation of points along raypath at observer

MLMAX - INTEGER Variable (Input) - Maximum number of altitude points

PARAMETER Declarations:

INTEGER       MAXLAT
PARAMETER     (MAXLAT=3)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC     MAX

Local Variable Declarations:

INTEGER       L, LB, KL, KK, LL
REAL          XDUM, PWR, DR, CN2AV

COMMON Blocks: None

REAL FUNCTION UDIF

Argument Declarations:

U1 - REAL Variable - Upward flux, layer 1
U2 - REAL Variable - Upward flux, layer 2
U3 - REAL Variable - Upward flux, layer 3
D1 - REAL Variable - Downward flux, layer 1
D2 - REAL Variable - Downward flux, layer 2
R2 - REAL Variable - Diffuse reflection coefficient, layer 2
R2S - REAL Variable - Directional reflection coefficient, layer 2
R3 - REAL Variable - Diffuse reflection coefficient, layer 3
T1 - REAL Variable - Transmission, layer 1
T2 - REAL Variable - Transmission, layer 2
G - REAL Variable - Composite R and T from FUNCTION GAM

Local Variable Declarations:

REAL          T, R, RR

COMMON Blocks: None
SUBROUTINE UDLAY

Argument Declarations:

U - REAL Variable (Output) - Diffuse Upward reflectance
D - REAL Variable (Output) - Diffuse Downward reflectance
ALBEDO - REAL Variable (Input) - Single scattering albedo
EXTENC - REAL Variable (Input) - Extinction coefficient (km⁻¹)
PHI - REAL Variable (Input) - Elevation angle at surface (deg)
B - REAL Variable (Input) - Average backscatter fraction
BU - REAL Variable (Input) - Backscatter fraction at PHI
RE - DOUBLE PRECISION Variable (Input) - Radius of the earth (km)
ZM - REAL Variable (Input) - Prior altitude (km)
Z - REAL Variable (Input) - Altitude of interest (km)
ZP - REAL Variable (Input) - Next altitude (km)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC    MAX, EXP, SIN, ABS, REAL, DBLE, LOG, SQRT
EXTERNAL      DRTLAY

Local Variable Declarations:

REAL         XMU0, TAU, GAMMA, DELTA, SIGMA, DUM, R, T

COMMON Blocks: /CONSTM/  

CHARACTER*(*) FUNCTION UPCASE

Argument Declarations:

STRING - CHARACTER*(*) Variable - Input string

INTRINSIC and EXTERNAL Declarations:

INTRINSIC    LEN, INDEX

Local Variable Declarations:

INTEGER      I, LOC
CHARACTER*26  UPPER, LOWER

COMMON Blocks:  None
SUBROUTINE USRBCK

Argument Declarations:

IBKGD - INTEGER Variable (Output) - Background index

PARAMETER Declarations:

<table>
<thead>
<tr>
<th>INTEGER</th>
<th>NMATL, NSCEN, MAXLAT, MAXLON, MOLMAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARAMETER</td>
<td>(NMATL=28, NSCEN=35, MAXLAT=3, MAXLON=1)</td>
</tr>
<tr>
<td>PARAMETER</td>
<td>(MOLMAX=26)</td>
</tr>
</tbody>
</table>

INTRINSIC and EXTERNAL Declarations:

| INTEGER      | IGTINT |
| REAL         | GETVAR |
| CHARACTER*3  | UPCASE |
| CHARACTER*72 | IOERR  |
| EXTERNAL     | IGTINT, GETVAR, GETVEC, IGTVEC, RDLINE, PARSE, BKGDBD, SCENBD, UPCASE, IOERR, CHRCBD, DEVCBD |

Local Variable Declarations:

| INTEGER      | I, J, K, IOS, N, JBCK, NVAR, ICOL0, ICOL40, JBCK2, NVAR4 |
| REAL         | DUMVEC(4), SLPSD |
| CHARACTER*1  | DOT |
| CHARACTER*20 | VRDATA(5) |
| CHARACTER*80 | DUMMY |
| CHARACTER*255 | VARIAB |

COMMON Blocks: /BACKGD/, /CHRCNM/, /DEVICE/, /SCENES/

SUBROUTINE USRCLD

Argument Declarations:

CLDBSU - REAL Variable (Output) - Cloud base altitude (km)
CLDTPU - REAL Variable (Output) - Cloud top altitude (km)

PARAMETER Declarations:

| INTEGER      | MOLMAX |
| PARAMETER    | (MOLMAX=26) |

INTRINSIC and EXTERNAL Declarations:

| INTEGER      | IGTINT |
| REAL         | GETVAR |
| CHARACTER*3  | UPCASE |
| CHARACTER*72 | IOERR  |
| EXTERNAL     | IGTINT, GETVAR, RDLINE, PARSE, UPCASE, IOERR, CLDRBD, DEVCBD |

Local Variable Declarations:

| INTEGER      | I, IOS, NVAR, ICOL0, ICOL40, NVAR6, NVAR8 |
| CHARACTER*1  | DOT |
| CHARACTER*20 | VRDATA(8) |
| CHARACTER*80 | TITLE, DUMMY |
| CHARACTER*255 | VARIAB |

COMMON Blocks: /CLDRN/, /CLDUSR/, /DEVICE/

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SUBROUTINE USRDEF

Argument Declarations:

- NFILE - INTEGER Variable (Input) - Device number
- HXTRA - REAL Vector (Len = Unspecified) (Input/Output) - Extra altitudes (km)
- NXTRA - INTEGER Variable (Input/Output) - Number of extra altitudes
- RE - DOUBLE PRECISION Variable (Output) - Earth radius (km)
- ISWITCH - INTEGER Variable (Input) - Switch for different files

PARAMETER Declarations:

- INTEGER MLMAX, NASMAX, NL, MAXLAT, MAXLON, NAZMAX, NGMAX, N2SMAX, ISMX, NVSMAX, MOLMAX, MLIDMX
- PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, N2SMAX=4)
- PARAMETER (MOLMAX=140, NL=50, MAXLAT=3, MAXLON=1)
- PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
- PARAMETER (NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

- INTEGER IGTINT, MDLATM
- REAL XMCONV, GETVAR, XTERP
- CHARACTER*1 LMCASE
- CHARACTER*3 UPCASE
- CHARACTER*72 IOERR
- INTRINSIC MAX, SQRT, COS, SIN, DBLE, MIN, ABS, INT, REAL
- EXTERNAL ATMSBD, XMCONV, RDLINE, GETVAR, XTERP, PARSE, MDLATM,
  IGTINT, EXMLBD, STMLBD, UPCASE, LMCASE, GBLBCK,
  IOERR

Local Variable Declarations:

- INTEGER K, L, IOS, NDATA, ICOL0, ICOL40, ITRP0, ITRP1, KK, LL,
  NVAR10, NVAR12, INDXP (MLMAX), ISCENE, MX1, MX2,
  INDXT (MLMAX), INDXM (ISMX, MOLMAX), MLAT
- REAL T0, P0, TORR, REX, PX, TX, TMIDN, TNOON, FRSNWP, FRICOP,
  FACLAT, ABSLAT, PX1, PX2, TX1, TX2, CX1, CX2, FRMTRP
- LOGICAL FLRD2, FLRD3, FLRD4, FLRD5, FLRD6
- CHARACTER*1 DOT
- CHARACTER*20 VRDATA (15)
- CHARACTER*80 TITLE, DUMMY
- CHARACTER*255 VARIAB

COMMON Blocks:

/ATMDAT/,/CONSTN/,/EXTMOL/,/HEADER/,/MOLEC/,
/STDMOL/,/USERDF/,/USERNM/
REAL FUNCTION VIRIAL

Argument Declarations:

T   - REAL Variable - Temperature (K)
WH2O - REAL Variable - Water vapor content (ppm)
INDX - REAL Variable - Index for virial coefficient

INTRINSIC and EXTERNAL Declarations:

REAL       XTERP
EXTERNAL    XTERP,VIRLBD

Local Variable Declarations:

REAL       AAA,AWW,AWWW,AAW,X

COMMON Blocks: /VIRDAT/

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REAL FUNCTION VISRH

Argument Declarations:

RH   - REAL Variable - Relative humidity (fraction)
IAERO - INTEGER Variable - Aerosol index
   IAERO = 1 implies Rural
   IAERO = 2 implies Urban
   IAERO = 3 implies Maritime
   IAERO = 4 implies Oceanic
   IAERO = 5 implies Tropospheric
   IAERO = 6 implies Desert
   IAERO = 7 implies Advection Fog
   IAERO = 8 implies Radiation Fog
   IAERO = 9 implies Light Rural Fog
   IAERO = 10 implies Light Urban Fog
   IAERO = 11 implies Light Maritime Fog
   IAERO = 12 implies Undefined
   IAERO = 13 implies Light Tropospheric Fog

Local Variable Declarations:

REAL       VIS0(13),EXPN(13)

COMMON Blocks: None
SUBROUTINE VSA

Argument Declarations:

VIS - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Sea level visible range (km)
CEILHT - REAL Variable (Input) - Cloud ceiling altitude (km)
DEPTH - REAL Variable (Input) - Cloud/fog depth (km)
ZINVHT - REAL Variable (Input) - Altitude of inversion or boundary layer (km)
NLAT - INTEGER Variable (Input) - Number of latitudes
NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER NVSA, MAXLAT, MAXLON
PARAMETER (NVSA=9, MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, EXP, MIN, LOG

Local Variable Declarations:

INTEGER IFOG, IVSA, I, K, KK, LL
REAL ZT, ZC, A(2), B(2), C(2), FAC1(9), FAC2(9), ZHIGH, D,
     ZINV, E, ZALGO, ANUM, F

COMMON Blocks: /VSADTA/
REAL FUNCTION XMCONV

Argument Declarations:

ZUSER - REAL Variable - User-defined altitude (km)
AUSER - REAL Variable - User-defined molecular concentration
INDX  - INTEGER Variable - Units index for AUSER
        INDX = 0 implies that molecular profile for M2 is to be used
        INDX = 1 implies that AUSER is provided in volume mixing ratio (ppmv)
        INDX = 2 implies that AUSER is provided in number density (cm^-3)
        INDX = 3 implies that AUSER is provided in mass mixing ratio (gm/kg)
        INDX = 4 implies that AUSER is provided in mass density (gm/m^3)
        INDX = 5 implies that AUSER is provided in partial pressure (mb)
        INDX = 6 implies that AUSER is provided in dew point temperature (K) (water vapor only)
        INDX = 7 implies that AUSER is provided in dew point temperature (deg. C) (water vapor only)
        INDX = 8 implies that AUSER is provided in relative humidity (per cent) (water vapor only)
PRESS - REAL Variable - Pressure at altitude Z (mb)
TEMP  - REAL Variable - Temperature at altitude Z (K)
Z     - REAL Vector (Len = Unspecified) - Altitude array (km)
AMOL  - REAL Vector (Len = Unspecified) - Molecular concentration used if INDX = 0 (ppmv)
NL    - INTEGER Variable - DIMENSION of Z and AMOL
KTYPE - INTEGER Variable - Molecular index
        KTYPE=1 implies water vapor

PARAMETER Declarations:

INTEGER       MLIDMX
PARAMETER     (MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

REAL           XTERP, SATUR
EXTERNAL       XTERP, SATUR, MOLPBD

Local Variable Declarations:

INTEGER       ITYPE0, ITYPE1, ITRP0
REAL           T0, AVOGAD, XLOSMT, TT, EW, RHDMU

COMMON Blocks:  /MOLDAT/
SUBROUTINE XPNDAR

Argument Declarations:

X - REAL Vector (Len = Unspecified) (Input) - X-array
Y - REAL Vector (Len = Unspecified) (Input/Output) - Y-array
N1 - INTEGER Variable (Input) - Length of X,Y-arrays already filled
N2 - INTEGER Variable (Input) - Length of Y-array to be filled

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
EXTERNAL XTERP

Local Variable Declarations:

INTEGER NP,I,ITRPI

COMMON Blocks: None

REAL FUNCTION XTERP

Argument Declarations:

X0 - REAL Variable - Value of X for which Y(X0) is to be found
X - REAL Vector (Len = Unspecified) - X-array (must be monotonically increasing)
Y - REAL Vector (Len = Unspecified) - Y-array as a function of X-array
N - INTEGER Variable - DIMENSION of X- and Y-arrays
NTYPE - INTEGER Variable - Index for the type of interpolation
         NTYPE = 0 implies linear interpolation
         NTYPE = 1 implies exponential interpolation
         NTYPE = 2 implies that Y(COS(X)), where X is in degrees
         and linear interpolation
         NTYPE = 3 implies that Y(COS(X)^2), where X is in
         degrees and linear interpolation
         NTYPE = 4 implies that Y(1/X) with linear interpolation
         NTYPE = 5 implies that Y(1/X) with exponential interpolation
         NTYPE = 6 implies that X is cyclical (i.e., X(1) follows X(N))
         with linear interpolation; it is assumed that 0 <= X <= 1.
         NTYPE = 7 implies an Aitken iterated polynomial
         interpolation. N must be less than or equal to NAIT.

PARAMETER Declarations:

INTEGER NAIT
PARAMETER (NAIT=100)

INTRINSIC and EXTERNAL Declarations:

INTEGER IBNSRC
INTRINSIC MAX,MIN,ABS,COS
EXTERNAL IBNSRC

Local Variable Declarations:

INTEGER J,K,KEY,KEYP
REAL FAC,DX,Z0,Z1,Z2,DZ,DUM,P(NAIT),Q(NAIT)

COMMON Blocks: /COMMON/
REAL FUNCTION ZLAT

Argument Declarations:

XLMBDA - REAL Variable - Geocentric ecliptic longitude
BETA - REAL Variable - Geocentric ecliptic latitude
LABSUN - REAL Variable - Earth heliocentric latitude
DIST - REAL Variable - Distance of the band
ASC - REAL Variable -
FI - REAL Variable -

INTRINSIC and EXTERNAL Declarations:

INTRINSIC
ABS, MOD, MAX, MIN, COS, ACOS, SIN, ASIN, SQRT

Local Variable Declarations:

REAL
PHI, PHI0, R, BETSOL, XX0, YY0, ZZ0, ANG, SNLONG, VAR, SOBLON, SE

COMMON Blocks: /CONSTN/

REAL FUNCTION ZODICL

Argument Declarations:

XLMBDA - REAL Variable - Ecliptic longitude (deg)
BETA - REAL Variable - Ecliptic latitude (deg)
V - REAL Variable - Wavenumber (cm⁻¹)
DV - REAL Variable - Wavenumber increment (cm⁻¹)
SOLDIS - REAL Variable - Normalized solar distance
LONG - REAL Variable - Longitude (in degrees and fractions of degrees, is east)
DAY - INTEGER Variable - Day of the month
MONTH - INTEGER Variable - Month of the year
YEAR - INTEGER Variable - Year
TIME - REAL Variable - Time (decimal) local standard (LST) or Greenwich mean (GMT)
ITIME - INTEGER Variable - Time index
ITIME = 0 implies local standard time
ITIME = 1 implies Greenwich mean time
ITIME = 2 implies local daylight savings time

INTRINSIC and EXTERNAL Declarations:

REAL
EMISSV, DBANDS

DOUBLE PRECISION
EPHTIM

INTRINSIC
REAL, SQRT, DBLE, AINT, INT, ABS, MOD, SIGN, COS, ACOS, SIN

EXTERNAL
EMISSV, GETGLC, DBANDS, ZOD2BD, EPHTIM

Local Variable Declarations:

INTEGER
I, J, NORDER, INDX, ISW

REAL
ZCUT, RE, RECL, RSYM, ZSYM, FUDGE, XECL, YECL, ZECL,
RMAX, XANG, LABSUN, DAYCNT, TEMP, DCIR, ZNLONG,
GMTDEG

DOUBLE PRECISION
RT(512), WT(512), ZOD, DDCIR, GAMMA, CENT, ZDEP, DUST,
XSINE, ETIME

COMMON Blocks: /CONSTN/, /ZPLANE/
SUBROUTINE ZROHDR

Argument Declarations: None

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX,
       NVSMAX, MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

Local Variable Declarations:

INTEGER I, K, M, KK, LL, MM

COMMON Blocks:/HEADER/

SUBROUTINE ZROINT

Argument Declarations:

NASPCT - INTEGER Vector (Len = Unspecified) (Input) - Number of
earth/skyshine angles
NAZSH - INTEGER Variable (Input) - Number of earth/skyshine azimuths
NAZ - INTEGER Vector (Len = Unspecified) (Input) - Number of
observer/source azimuths
BW - REAL Variable (Input/Output) - Bandwidth (cm⁻¹)
BWL - REAL Variable (Input/Output) - Bandwidth (µm)

PARAMETER Declarations:

INTEGER NAZMAX, MMAX, NASMAX, NZSMAX, NMATL, MAXLAT, MAXLON,
       NGMAX
PARAMETER (NAZMAX=30, NASMAX=15, NZSMAX=4, NGMAX=15)
PARAMETER (MMAX=140, NMATL=28, MAXLAT=3, MAXLON=1)

Local Variable Declarations:

INTEGER I, M, MM, LB, IGEOM, LS

COMMON Blocks:/BCXDAT/,/INTSTO/
BLOCK DATA ARSABD

PARAMETER Declarations:

INTEGER NWLAEI, NWLCLD
PARAMETER (NWLAEI=47, NWLCLD=79)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /AERSLA/

BLOCK DATA ARSLBD

PARAMETER Declarations:

INTEGER NWLAEI, NWLCLD, NANG
PARAMETER (NWLAEI=47, NWLCLD=79, NANG=65)

Local Variable Declarations:

INTEGER J, K

COMMON Blocks: /AEROSL/

BLOCK DATA ARSXBD

PARAMETER Declarations:

INTEGER NWLAEI, NWLCLD
PARAMETER (NWLAEI=47, NWLCLD=79)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /AERSLX/

BLOCK DATA ATMSBD

PARAMETER Declarations:

INTEGER NL, MAXLAT, MAXLON
PARAMETER (NL=50, MAXLAT=3, MAXLON=1)

Local Variable Declarations:

INTEGER L

COMMON Blocks: /ATMDAT/
BLOCK DATA BKGDBD

PARAMETER Declarations:

INTEGER NMATL, MAXLAT, MAXLON
PARAMETER (NMATL=28, MAXLAT=3, MAXLON=1)

Local Variable Declarations:

INTEGER I
COMMON Blocks: /BACKGD/

BLOCK DATA BKSTBD

PARAMETER Declarations:

INTEGER NWLAER, NSTTMP
PARAMETER (NWLAER=47, NSTTMP=15)

Local Variable Declarations:

INTEGER I
COMMON Blocks: /BSTAER/

BLOCK DATA BRBNBD

COMMON Blocks: /CLDPAR/, /FLXTAB/, /SWPARM/

BLOCK DATA CFCBD

Local Variable Declarations:

INTEGER I, J
COMMON Blocks: /CFCBM/

BLOCK DATA CHRCBD

Local Variable Declarations:

INTEGER I
COMMON Blocks: /CHRCNM/
BLOCK DATA CIRRB

PARAMETER Declarations:

<table>
<thead>
<tr>
<th>INTEGER</th>
<th>NWLAER, NWLCLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARAMETER</td>
<td>(NWLAER=47, NWLCLD=79)</td>
</tr>
</tbody>
</table>

Local Variable Declarations:

<table>
<thead>
<tr>
<th>INTEGER</th>
<th>I</th>
</tr>
</thead>
</table>

COMMON Blocks:

/CAPSYM/

---

BLOCK DATA CLDRBD

Local Variable Declarations:

<table>
<thead>
<tr>
<th>INTEGER</th>
<th>L</th>
</tr>
</thead>
</table>

COMMON Blocks:

/CLDRN/

---

BLOCK DATA CROSB

Local Variable Declarations:

<table>
<thead>
<tr>
<th>INTEGER</th>
<th>I, J</th>
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</thead>
</table>

COMMON Blocks:

/CRSECT/

---

BLOCK DATA DEVCBD

PARAMETER Declarations:

<table>
<thead>
<tr>
<th>INTEGER</th>
<th>MOLMAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARAMETER</td>
<td>(MOLMAX=26)</td>
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</tbody>
</table>

COMMON Blocks:

/DEVCMN/, /DEVICE/, /MACHIN/

---

BLOCK DATA DSRTBD

PARAMETER Declarations:

<table>
<thead>
<tr>
<th>INTEGER</th>
<th>NWLAER</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARAMETER</td>
<td>(NWLAER=47)</td>
</tr>
</tbody>
</table>

Local Variable Declarations:

<table>
<thead>
<tr>
<th>INTEGER</th>
<th>I</th>
</tr>
</thead>
</table>

COMMON Blocks:

/DESDAT/

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BLOCK DATA ECOSBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /ECOCNV/,/ECOSYS/

---

BLOCK DATA EMISBD

PARAMETER Declarations:

INTEGER NLMAX
PARAMETER (NLMAX=10)

Local Variable Declarations:

INTEGER I,L

COMMON Blocks: /CDRYDS/,/WETNES/

---

BLOCK DATA EXMLBD

PARAMETER Declarations:

INTEGER NL
PARAMETER (NL=50)

Local Variable Declarations:

INTEGER L

COMMON Blocks: /EXTMOL/

---

BLOCK DATA GLCFBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /GAUSSL/

---

BLOCK DATA H2OBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /CONTNS/

---
BLOCK DATA HAZEBD

PARAMETER Declarations:

INTEGER NZBNDR, NZTROP, NZSTRA, NZUPR
PARAMETER (NZBNDR=3, NZTROP=9, NZSTRA=17, NZUPR=14)

Local Variable Declarations:

INTEGER L

COMMON Blocks: /HZDATA/

---

BLOCK DATA ICEBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /ICEREF/

---

BLOCK DATA INLBD

Local Variable Declaration

INTEGER I

COMMON Blocks: /INFLTR/

---

BLOCK DATA INPTBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /INPTDT/, /INPNDX/

---

BLOCK DATA LAGRBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /LAGUER/
BLOCK DATA LUNPBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /PERLUN/

BLOCK DATA MARNBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /NAVMAR/

BLOCK DATA MOLNBD

PARAMETER Declarations:

INTEGER NSMX, MLIDMX
PARAMETER (MLIDMX=45, NSMX=MLIDMX+8)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /MOLNMX/

BLOCK DATA MOLPBD

PARAMETER Declarations:

INTEGER MLLMAX, MAXLAT, MAXLON, MLIDMX
PARAMETER (MLLMAX=140, MLIDMX=45)
PARAMETER (MAXLAT=3, MAXLON=1)

Local Variable Declarations:

INTEGER I, J

COMMON Blocks: /MOLCON/, /MOLDAT/
BLOCK DATA NO2BD

PARAMETER Declarations:

<table>
<thead>
<tr>
<th>INTEGER</th>
<th>NMAX</th>
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<tr>
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<td>(NMAX=7176)</td>
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Local Variable Declarations:

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</thead>
</table>

COMMON Blocks: /NO2XS/

BLOCK DATA O2CBD

COMMON Blocks: /O2C/

BLOCK DATA O2UVBD

Local Variable Declarations:

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COMMON Blocks: /HERZBG/, /SHURUN/

BLOCK DATA O3CWBD

PARAMETER Declarations:

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<th>INTEGER</th>
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</thead>
<tbody>
<tr>
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<td>(NMAX=3080)</td>
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</tbody>
</table>

Local Variable Declarations:

<table>
<thead>
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<th>INTEGER</th>
<th>I</th>
</tr>
</thead>
</table>

COMMON Blocks: /O3CWB/

BLOCK DATA O3HHBD

Local Variable Declarations:

<table>
<thead>
<tr>
<th>INTEGER</th>
<th>I</th>
</tr>
</thead>
</table>

COMMON Blocks: /O3HHB/
BLOCK DATA OCNTBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /TMPOCN/

-------------------

BLOCK DATA PHFGBD

PARAMETER Declarations:

INTEGER NWLAER, NANG
PARAMETER (NWLAER=47, NANG=65)

Local Variable Declarations:

INTEGER J, K

COMMON Blocks: /PHFFOG/

-------------------

BLOCK DATA PHHYBD

PARAMETER Declarations:

INTEGER NWLCLD
PARAMETER (NWLCLD=79)

Local Variable Declarations:

INTEGER J

COMMON Blocks: /PHHYDR/

-------------------

BLOCK DATA PHMABD

PARAMETER Declarations:

INTEGER NANG
PARAMETER (NANG=65)

Local Variable Declarations:

INTEGER J, K

COMMON Blocks: /PHFMAR/

-------------------

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BLOCK DATA PHOCBD

PARAMETER Declarations:

INTEGER NANG
PARAMETER (NANG=65)

Local Variable Declarations:

INTEGER J,K

COMMON Blocks: /PHFOCE/

---

BLOCK DATA PHRBBD

PARAMETER Declarations:

INTEGER NANG
PARAMETER (NANG=65)

Local Variable Declarations:

INTEGER J,K

COMMON Blocks: /PHFRRU/

---

BLOCK DATA PHSTBD

PARAMETER Declarations:

INTEGER NANG
PARAMETER (NANG=65)

Local Variable Declarations:

INTEGER J,K

COMMON Blocks: /PHFSTR/

---

BLOCK DATA PHTRBD

PARAMETER Declarations:

INTEGER NANG
PARAMETER (NANG=65)

Local Variable Declarations:

INTEGER J,K

COMMON Blocks: /PHFTRP/
BLOCK DATA PHURBD

PARAMETER Declarations:

INTEGER NANG  
PARAMETER (NANG=65)

Local Variable Declarations:

INTEGER J, K

COMMON Blocks: /PHFURB/

-----

BLOCK DATA RAINBD

PARAMETER Declarations:

INTEGER NWLCLD  
PARAMETER (NWLCLD=79)

Local Variable Declarations:

INTEGER J

COMMON Blocks: /RAINTP/, /RAINWL/

-----

BLOCK DATA REFRBD

Local Variable Declarations:

INTEGER L

COMMON Blocks: /MMWREF/

-----

BLOCK DATA SCENBD

PARAMETER Declarations:

INTEGER NSCEN, NMATL  
PARAMETER (NSCEN=35, NMATL=28)

Local Variable Declarations:

INTEGER K

COMMON Blocks: /SCENES/
BLOCK DATA SICEBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SICEDT/

--------

BLOCK DATA SNOWBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SNWDAT/

--------

BLOCK DATA SO2BD

PARAMETER Declarations:

INTEGER NMAX
PARAMETER (NMAX=5562)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SO2XS/

--------

BLOCK DATA SLR1BD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SOLIR1/

--------

BLOCK DATA SLR2BD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SOLIR2/
BLOCK DATA SLR3BD

Local Variable Declarations:

    INTEGER     I

COMMON Blocks:      /SOLIR3/

BLOCK DATA SLR4BD

Local Variable Declarations:

    INTEGER     I

COMMON Blocks:      /SOLIR4/

BLOCK DATA SLR5BD

Local Variable Declarations:

    INTEGER     I

COMMON Blocks:      /SOLIR5/

BLOCK DATA STMLBD

PARAMETER Declarations:

    INTEGER     NL
    PARAMETER   (NL=50)

Local Variable Declarations:

    INTEGER     L

COMMON Blocks:      /STDMOL/

BLOCK DATA UFTPBD

Local Variable Declarations:

    INTEGER     I

COMMON Blocks:      /UFTAPE/
BLOCK DATA UPPRB

PARAMETER Declarations:

INTEGER MAXLAT, MAXLON, NLUFR, NTEXO
PARAMETER (MAXLAT=3, MAXLON=1, NLUFR=8, NTEXO=11)

Local Variable Declarations:

INTEGER L
COMMON Blocks: /UPRATM/

BLOCK DATA VRLBD

COMMON Blocks: /VIRDAT/

BLOCK DATA WTRBD

PARAMETER Declarations:

INTEGER NWLWTR, NFRQ
PARAMETER (NWLWTR=169, NFRQ=28)

Local Variable Declarations:

INTEGER I
COMMON Blocks: /INDXWR/

BLOCK DATA ZOD1BD

Local Variable Declarations:

INTEGER I
COMMON Blocks: /SILEMS/

BLOCK DATA ZOD2BD

Local Variable Declarations:

INTEGER I
COMMON Blocks: /ZDDBND/, /ZPLANE/
PROGRAM ASCBIN

PARAMETER Declarations:

INTEGER MOLMAX
PARAMETER (MOLMAX=26)

INSTRINSIC and EXTERNAL Declarations:

CHARACTER*1 UPCASE
CHARACTER*72 IOERR
EXTERNAL CONVAB, TABLEA, TABLEB, PLOTH, DEVCHD, FILRT,
SETFIL, PROMPT, CONFIG, UPCASE, IOERR, CNSTNT

Local Variable Declarations:

INTEGER K, KTER, IWORK, IPBIN, JASC, JTB, IERR, IOS
CHARACTER*1 CX
CHARACTER*40 FILERT
CHARACTER*80 FILENM(17), FILBIN

COMMON Blocks: /DEVCMN/, /DEVICE/

SUBROUTINE CONVAB

Argument Declarations:

ICONV - INTEGER Variable (Input) - Index for type of conversion
ICONV = 0 implies a binary to ASCII conversion
Otherwise, an ASCII to binary conversion
IPBIN - INTEGER Variable (Input) - Binary file unit number
FILBIN - CHARACTER(*) Variable (Input) - Binary file name
IPASC - INTEGER Variable (Input) - ASCII file unit number
FILASC - CHARACTER(*) Variable (Input) - ASCII file name
IERR - INTEGER Variable (Output) - Error index

PARAMETER Declarations:

INTEGER NVSMAX, NGMAX
PARAMETER (NVSMAX=20, NGMAX=15)

INSTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL SETFIL, IOERR

Local Variable Declarations:

INTEGER NHDR(2), NVAR(NGMAX), IV, IVSET, IVS, IG, NVSET,
       NVS(NVSMAX), IH, IOS, ITER, JTER, IHDR(2000),
       NGEOM, IVSETX, IVSX, IGEOM
* REAL HDR(2500), VAR(10000)
* CHARACTER*1 DUMMY
* CHARACTER*40 HEADNG
* CHARACTER*80 TITLE

* COMMON Blocks: None

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SUBROUTINE SETFIL

Argument Declarations:

NFILE - INTEGER Variable (Input) - File unit number
FILNAM - CHARACTER*(*) Variable (Input) - File name
IERR - INTEGER Variable (Output) - Error index

INRINSIC and EXTERNAL Declarations:

CHARACTER*72  IOERR
EXTERNAL       IOERR

Local Variable Declarations:

INTEGER     IOS
LOGICAL     FXST
CHARACTER*11 FMT(2)

COMMON Blocks: None

SUBROUTINE SLITFN

Argument Declarations:

X    - REAL Vector (Len = Unspecified) (Input/Output) - Element of variables being convolved with slit function
SLIT - REAL Array (Dim = NDV x Unspecified) (Input/Output) - Running of convolved value (temporary storage)
SUM  - REAL Vector (Len = Unspecified) (Input/Output) - Running integral of slit function (temporary storage)
VP   - REAL Vector (Len = Unspecified) (Input/Output) - Previous wavenumbers (cm⁻¹)
DVP  - REAL Vector (Len = Unspecified) (Input/Output) - Previous spectral increment (cm⁻¹)
NDV  - INTEGER Variable (Input) - Maximum number of spectral points
NDAT - INTEGER Variable (Input) - Number of data sets
V    - REAL Variable (Input) - Wavenumber (cm⁻¹)
DV   - REAL Variable (Input) - Spectral increment (cm⁻¹)
RESOL-REAL Variable (Input) - Slit full width at half maximum (cm⁻¹)

INRINSIC and EXTERNAL Declarations:

INRINSIC       MAX,ABS

Local Variable Declarations:

INTEGER       I,J,JP
REAL           WGT

COMMON Blocks: None
SUBROUTINE TABLEA

Argument Declarations:

IPATM - INTEGER Variable (Input) - Source binary file number
IFTBL - INTEGER Variable (Input) - Tabular file unit number

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, MLMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX, NDV, NSLTD
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MLMAX=140, MAXLAT=3, MAXLON=1)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (NVSMAX=20, NDV=200, NSLTD=5)

INTRINSIC and EXTERNAL Declarations:

REAL FILTER
CHARACTER*4 UPCASE
CHARACTER*72 IOERR
INTRINSIC MOD
EXTERNAL GETHDR, PROMPT, IOERR, FILTER, SLITFN, UPCASE, RDFLTR

Local Variable Declarations:

INTEGER IPRNT, M, KAZ, MM, MMP, IG, IVP, K, IOS, NBCKZ, ML0,
        NVAR (NGMAX), IGEOM, IGX, JMOD, IFLTR, IV, IVS
REAL TAUSH (NASMAX, NZSMAX), RADSH (NASMAX, NZSMAX), FLTR,
       RADST (NAZMAX), WL, WVL, RADSE (NASMAX, NZSMAX),
       RADSS (NASMAX, NZSMAX), RADSC (NASMAX, NZSMAX),
       RDSLST (NAZMAX), DV (NDV), RDSLST (NAZMAX), RESX,
       RADE (NAZMAX), TAUT (NAZMAX), SIGMET (NAZMAX),
       RADER (NAZMAX), RADSD (NAZMAX), RADLNT (NAZMAX),
       ZBCKZ (MLMAX), DRADT (NAZMAX), TAUSCT (NAZMAX),
       TAUB (NAZMAX), RADB (NAZMAX), TAUSCB (NAZMAX),
       RADSLT (NAZMAX), DRADB (NAZMAX), SUM (NSLTD),
       SWBCK (MLMAX, NGMAX), TBCK (MLMAX, MAXLAT, MAXLON),
       ZL (MLMAX), SIGMEB (NAZMAX), SLJT (NDV, NSLTD), DV0,
       XSLIT (NSLTD), SUMSLT (NDV), V (NDV), RES, RESW, V0,
       LATST (MAXLAT), LONST (MAXLON)
CHARACTER*24 TFLTR
CHARACTER*40 HEADNG
CHARACTER*80 TITLE, FILENM

COMMON Blocks: /HEADER/
SUBROUTINE TABLEB

Argument Declarations:

IFBCK - INTEGER Variable (Input) - Background binary file number
IFTBL - INTEGER Variable (Input) - Tabular file unit number

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, MLMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX, NDV, NSLTD
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MLMAX=140, MAXLAT=3, MAXLON=1)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (NVSMAX=20, NDV=200, NSLTD=5)

INTRINSIC and EXTERNAL Declarations:

REAL FILTER
CHARACTER*4 UPCASE
CHARACTER*72 IOERR
INTRINSIC MOD
EXTERNAL GETHDR, PROMPT, IOERR, FILTER, SLITFN, UPCASE, RDFLTR

Local Variable Declarations:

INTEGER IPNRT, IZ, M, KAZ, IZBCK, IG, MM, IV, K, NBCKZ, IOS, ML0, NVAR (NGMAX), IGEOM, IGP, IVS, IVP, IFLTR, JMOD
REAL ZBCKZ (MLMAX), TAUEZ (NAZMAX, MLMAX), RES, RESWL, SIGMEZ (NAZMAX, MLMAX), TAUZCZ (NAZMAX, MLMAX), RADBZ (NAZMAX, MLMAX), WL, VWL, FLTR, RESX, DRADZ (NAZMAX, MLMAX), DV (NDV), SUM (NSLTD), RDSLZ (NAZMAX, MLMAX), RDLNBZ (NAZMAX, MLMAX), RDSZBCZ (NAZMAX, MLMAX), RADSHB (NAZMAX, MLMAX), RDSZBSB (NAZMAX, MLMAX), ZL (MLMAX), V0, DVO, SWBCK (MLMAX, NGMAX), TBCK (MLMAX, MAXLAT, MAXLON), XSLIT (NSLTD), SLIT (NDV, NSLTD), V (NDV), SUMSLIT (NDV), LATST (MAXLAT), LONST (MAXLON)
CHARACTER*24 TPLTR
CHARACTER*40 HEADING
CHARACTER*80 TITLE, FILENM

COMMON Blocks: /HEADER/
SUBROUTINE TABLEH

Argument Declarations:

IFHTR - INTEGER Variable (Input) - Heat transfer binary file number
IFTBL - INTEGER Variable (Input) - Tabular file unit number

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX,
       NTIME, MLMAX, NVSMAX, MOLMAX
PARAMETER (NGMAX=15, NASMAX=30, NAZMAX=15, NZSMAX=4)
PARAMETER (NTIME=97, NVSMAX=20)
PARAMETER (MAXLAT=3, MAXLON=1, MLMAX=140)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
INTRINSIC MOD
EXTERNAL GETHDR, PROMPT, IOERR

Local Variable Declarations:

INTEGER L, L0, KK, LL, IOS, ITM, IZ, NBCKZ, ML0, NVAR(NGMAX),
       ITIM
REAL DECTIM(NTIME), SOLVX(NTIME, MAXLAT, MAXLON),
       BSIZ(10, NTIME, MAXLAT, MAXLON), LATST(MAXLAT),
       USIZ(10, NTIME, MAXLAT, MAXLON), LONST(MAXLON),
       DSIZ(10, NTIME, MAXLAT, MAXLON),
       ULWZ(10, NTIME, MAXLAT, MAXLON),
       DLWZ(10, NTIME, MAXLAT, MAXLON),
       SWBCX(MLMAX, NGMAX), ZSCKZ(MLMAX), ZLYR(10),
       TLYR(10, NTIME, MAXLAT, MAXLON),
       RHLYR(10, NTIME, MAXLAT, MAXLON),
       SOLAUX(NTIME, MAXLAT, MAXLON), ZL(MLMAX),
       TBCK(MLMAX, MAXLAT, MAXLON)

CHARACTER*40 HEADNG
CHARACTER*80 TITLE

COMMON Blocks:

/HEADER/
SUBROUTINE TABLET

Argument Declarations:

IFTRN - INTEGER Variable (Input) - Molecular transmittance binary file number
IFTBL - INTEGER Variable (Input) - Tabular file unit number

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NNSMAX, MAXLAT, MAXLON, ISMX,
MLMAX, NVSMAK, MOLMAX, NSLTD, NDV, MLIDMX, NSMX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NNSMAX=4)
PARAMETER (NVSMAK=20, NSLTD=4, NDV=200)
PARAMETER (MAXLAT=3, MAXLON=1, MMLMAX=140)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (MLIDMX=45, NSMX=MLIDMX+8)

INTRINSIC and EXTERNAL Declarations:

REAL FILTER
CHARACTER*4 UPCASE
CHARACTER*72 IOERR
INTRINSIC MOD, INT, MIN
EXTERNAL GETHDR, PROMPT, IOERR, FILTER, SLITFN, UPCASE, MOLNBD

Local Variable Declarations:

INTEGER M, N, KAZ, MM, IG, IVP, K, IOS, NBCKZ, ML0, MOLX, IM, IM1,
+ NVAR (NGMAX), IGBOM, IGX, JMOD, IV, IVS, IM2, IM3,
+ NMOLEC, MOLID (NSMX), IM4
REAL WL, DV (NDV), RESX, ZBCKZ (MLMAX), RESWL, V0,
+ SWBCK (MMLMAX, NGMAX), SUMSLT (NDV), V (NDV), RES,
+ TBCK (MLMAX, MAXLAT, MAXLON), ZL (MLMAX),
+ SLIT (NDV, NSLTD), DV0, XSLIT (NSLTD),
+ Taulr (NAZMAX), SPCTR (ISMX, 3, NAZMAX),
+ LATST (MAXLAT), LONST (MAXLON)
CHARACTER*40 HEADNG
CHARACTER*80 TITLE

COMMON Blocks: /HEADER/*MOLNMX/
PROGRAM BTEMP

PARAMETER Declarations:

INTEGER
NGMAX, NAZMAX, NASMX, NZSMAK, MLMAX, MAXLAT, MAXLON,
ISMX, NVSMAK, MOLMAX, MLIDMX
PARAMETER
(NGMAX=15, NAZMAX=30, NASMX=15, NZSMAK=4)
PARAMETER
(MLMAX=140, MAXLAT=3, MAXLON=1)
PARAMETER
(MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
PARAMETER
(NVSMAK=20)

INTRINSIC and EXTERNAL Declarations:

REAL
INVPLK, FILTER
CHARACTER*72
IOERR
INTRINSIC
REAL, DBLE, SQRT, COS, SIN
EXTERNAL
CNSTNT, DEVCBD, SUMFIL, GETHDR, INVPLK, FILTER,
        RDFLKR, PROMPT, CONFIG, SETFLG, IOERR, IFLRT

Local Variable Declarations:

INTEGER
IOS, IG, IV, MM, M, IFLTR, IVS, NBCKZ, ML0, NVAR (NGMAX),
        IGP, IGEOM, IGX
REAL
V, DV, ZECK (MLMAX), SWBCK (MLMAX, NGMAX), WL, TMP1,
        TAUT (NAZMAX), TMP2, DRADT (NAZMAX), TMPBCK, WL1,
        RADSAT (NAZMAX), RADB (NAZMAX), SIGMA (NAZMAX),
        TASSCT (NAZMAX), RADT (NAZMAX), TAUB (NAZMAX),
        RADSH, SIGMEX (NAZMAX), TMPDRT, TASCBB (NAZMAX),
        RADS (NAZMAX), VBAR, TMPML, TMPMN, TMSDST, RADSS,
        RDSLS (NAZMAX), RDSLSS (NAZMAX), RADF (NAZMAX),
        RADD (NAZMAX), RADBE (NAZMAX), RABB (NAZMAX), TMBBE,
        TMBBR, WL2, RADT (NAZMAX), TAU1 (NAZMAX), TAU2 (NAZMAX),
        RADSC, RAD1 (NAZMAX), RAD2 (NAZMAX), TMPSTL, TMPSTB,
        DRAADT (NAZMAX), RDRADT (NAZMAX), BW, BWL, DFLT,
        SGMET (NAZMAX), SGMETB (NAZMAX), ZL (MLMAX),
        TASCCT (NAZMAX), TASCBB (NAZMAX), RADS (NAZMAX),
        RDSLS (NAZMAX), RDLNT (NAZMAX), TMPDRT, DUM,
        RSLST (NAZMAX), RADD (NAZMAX), RABB (NAZMAX),
        TISH, TSBCK (MLMAX, MAXL, MAXLON), RADSE,
        DRADB (NAZMAX), RSLST (NAZMAX), LATST (MAXLAT),
        LONST (MAXLON)

DOUBLE PRECISION
RE, REPOL, REQU
CHARACTER*24
TRFLTR
CHARACTER*40
HEADNG, FILERT
CHARACTER*50
TLBL (18)
CHARACTER*80
TITLE, FILENM (14), NFFLTR

COMMON Blocks:
        /CONSTN/, /DEVICE/, /FLAGS/, /HEADER/, /MOLEC/,
        /USERNM/
REAL FUNCTION INVPLK

Argument Declarations:

RADNCE - REAL Variable - Radiance (W/cm²/sr/cm⁻¹).
V   - REAL Variable - Wavenumber (cm⁻¹)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL,DBLE,LOG

Local Variable Declarations:

DOUBLE PRECISION X,Y,C1,C2

COMMON Blocks: /CONSTN/

SUBROUTINE CVJTK

Argument Declarations:

JCHAR - CHARACTER(*) Vector (Len = Unspecified) - MODTRAN string
KNDX  - INTEGER Vector (Len = Unspecified) - MOSART string

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
INTRINSIC LEN
EXTERNAL IOERR

Local Variable Declarations:

INTEGER K,IOS
CHARACTER*6 F

COMMON Blocks: None

SUBROUTINE CRBKGD

Argument Declarations:

IFUBK - INTEGER Variable (Input) - Background file number
FILNAM - CHARACTER(*) Variable (Input) - Input file name
IERR  - INTEGER Variable (Output) - Error index

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL INBKBD,DEVCBD,IOERR

Local Variable Declarations:

INTEGER I,IOS
LOGICAL FXSUBK

COMMON Blocks: /INBKGD/,/MACHIN/
PROGRAM CRFILE

PARAMETER Declarations:

INTEGER MOLMAX
PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL DEVCBD,FILRT,MENU,CRINPT,CRFLTR,CRBKGD,CRUATM,
CRIUCLD,CRIUER,PROMPT,CONFIG,RMDTN,IOERR

Local Variable Declarations:

INTEGER IWORK,IERR,IOS,INDXI
CHARACTER*40 FILERT
CHARACTER*80 FILENM(17)

COMMON Blocks: /DEVICE/

SUBROUTINE CRFLTR

Argument Declarations:

IFFLT - INTEGER Variable (Input) - Filter response file number
FILNAM - CHARACTER*(*) Variable (Input) - Input file name
IERR - INTEGER Variable (Output) - Error index

INTRINSIC and EXTERNAL Declarations:

INTEGER LENSTR
CHARACTER*1 UPCASE
CHARACTER*72 IOERR
EXTERNAL INFIBD,DEVCBD,IOERR,PROMPT,UPCASE,LENSTR,LCTRIM

Local Variable Declarations:

INTEGER I,IOS,IFFLTSW,NFLTR,IFMOD,NF,NEW,IFT,IPRINT,
       KDE,NLOW,IFWV,NW,LENF
REAL WLF(200),FLTR(200),TEMP
LOGICAL FXSFLT
CHARACTER*1 RESPON
CHARACTER*2 WNLF(0:1)
CHARACTER*20 IDFIL
CHARACTER*24 TFLTR
CHARACTER*80 NFMOD

COMMON Blocks: /INFLTR/,/MACHIN/
SUBROUTINE CRINPT

Argument Declarations:

NILE - INTEGER Variable (Input) - File number
FILNAM - CHARACTER*(*) Variable (Input) - Input file name
IERR - INTEGER Variable (Output) - Error index

PARAMETER Declarations:

INTEGER NGMAX
PARAMETER (NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

REAL GETVAR
CHARACTER*1 UPCASE,LWCASE
CHARACTER*72 IOERR
EXTERNAL INPTBD,DEVCBD,MENU,LCTRIM,GETVAR,UPCASE,LWCASE,
               IOERR,PROMPT,CRUATM,MONTH,IGTINT,CALEND,
               CHTIME

Local Variable Declarations:

INTEGER I,J,IOS,IMENU(154),LENX
REAL HO,HS,SLANG,BETA,PHIO,PHIS,HT
LOGICAL FXSFL1
CHARACTER*1 RESPON,BLANK,V1,V2
CHARACTER*40 VARIAB,VX,VY,VZ,VU,VV,VL
CHARACTER*80 STRING

COMMON Blocks: /HEADER/,/INPNDX/,/INPTDT/,/MACHIN/

SUBROUTINE CRUAEER

Argument Declarations:

IFUAR - INTEGER Variable (Input) - Aerosol file number
FILNAM - CHARACTER*(*) Variable (Input) - Input file name
IERR - INTEGER Variable (Output) - Error index

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL INARBD,DEVCBD,IOERR

Local Variable Declarations:

INTEGER I,IOS
LOGICAL FXSUAR

COMMON Blocks: /INUAER/,/MACHIN/
SUBROUTINE CRUATM

Argument Declarations:

* IFUAT - INTEGER Variable (Input) - Atmosphere file number
FILNAM - CHARACTER(*) Variable (Input) - Input file name
IERR - INTEGER Variable (Output) - Error index
FLUATM - LOGICAL Variable (Input) - Flag for creation of separate user-defined atmosphere file

INTRINSIC and EXTERNAL Declarations:

    CHARACTER*72 IOERR
    INTRINSIC INDEX, REAL, LEN, INT, MAX
    EXTERNAL INPTBD, DEVCBD, IOERR, MSAG, PROMPT, CHTIME, CALEND,
             GETVAR, IGTINT, UPCASE

Local Variable Declarations:

    INTEGER I, IOS
    LOGICAL FXSUAT
    CHARACTER*50 INPATM(2)

COMMON Blocks: /HEADER/, /INPNDX/, /INPTDT/, /MACHIN/

SUBROUTINE CRUCLD

Argument Declarations:

    IFUCL - INTEGER Variable (Input) - Hydrometeor file number
FILNAM - CHARACTER(*) Variable (Input) - Input file name
IERR - INTEGER Variable (Output) - Error index

INTRINSIC and EXTERNAL Declarations:

    CHARACTER*72 IOERR
    EXTERNAL INCLBD, DEVCBD, IOERR

Local Variable Declarations:

    INTEGER I, IOS
    LOGICAL FXSUCL

COMMON Blocks: /INUCLD/, /MACHIN/

BLOCK DATA INARED

Local Variable Declaration

    INTEGER I

COMMON Blocks: /INUAER/
BLOCK DATA INBKBD

Local Variable Declaration

INTEGER I

COMMON Blocks: /INBKGD/

END

BLOCK DATA INCLBD

COMMON Blocks: /INUCLD/

SUBROUTINE MDRI

PARAMETER Declarations:

INTEGER MOLMAX
PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

REAL AFTERP, DNO, OHCALC, POZONE, SINTRP, TDEP, VP
EXTERNAL AFTERP, DNCALC, DNO, DREAD, GTD6, INTERP, OHCALC,
+ POZONE, SINTRP, SUN, TDEP, VP, DEVCBD, NRLBD

Local Variable Declarations:

INTEGER K, KMAX, IXM, IXP
REAL D(8), T(2), ALT, APNO, AR72, AR90, CNO, CNODAY, CNONIT,
+ CO2AR, CO2MIX, CONC, D40, DAYAV, DAYO, DAYO3,
+ DENS, DENS2, DN, FLUXC2, FLUXNO,
+ H80, O272, O280, O290, O372, O380, O60, O86, ODM72,
+ ODMR72, OH72, OH80, ORATIO, PMBAR, PREVKP, RIS, RLAT,
+ RNO100, RNO90, RRLAT, SET, SUNRIS, SUNSET,
+ TEMP80, TINF, TK, TMP, TOTN, TROPHT, TROPT, VALUE,
+ W1, W2, WT, X120, X150, X300, X90, XO3D, XO3D80,
+ XO3N, XO3N80, XOD, XO8D80, XON, XON80, NITEO, NITEO3,
+ SOD(46), SON(46), SO3D(46), SO3N(46), N280, N272,
+ N290, T8, D8
CHARACTER*80 FILENM

COMMON Blocks: /DEVCMN/, /NRLFIL/, /SPECIE/

END
SUBROUTINE MENU

Argument Declarations:

IMENU - INTEGER Variable (Input) - Menu index

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL CHRCBD,PROMPT,IOERR

Local Variable Declarations:

INTEGER IS(24),IM(24),I,J,IOS
CHARACTER*1 DUMMY
CHARACTER*3 DASH
CHARACTER*3 CHMTH(12)
CHARACTER*5 CHAER(0:19)
CHARACTER*6 CHATM(0:10),CHAZE(0:9),CHSEA(0:10),CHMES(0:2)
CHARACTER*39 SEAS(4)

COMMON Blocks: /CHRCNM/

SUBROUTINE MSAG

Argument Declarations:

AP - REAL Vector (Len = Unspecified) (Input) - Geomagnetic planetary indices
F107 - REAL Variable (Input) - Solar Flux at 10.2 cm
F107A - REAL Variable (Input) - 3-month mean value of solar flux
XLAT - REAL Variable (Input) - Latitude
XLONG - REAL Variable (Input) - Longitude
IDAY - INTEGER Variable (Input) - Day of the month
MONTH - INTEGER Variable (Input) - Month of the year
IYEAR - INTEGER Variable (Input) - Year
TIME - REAL Variable (Input) - Time (decimal) local standard (LST) or Greenwich mean (GMT)
ITIME - INTEGER Variable (Input) - Time index
ITIME = 0 implies local standard time
ITIME = 1 implies Greenwich mean time
ITIME = 2 implies local dayligh saving time
SUNRIS - REAL Variable (Output) - Sunrise (hour)
SUNSET - REAL Variable (Output) - Sunset (hour)
Continuous day if SUNRIS = SUNSET = 0.0
Continuous night if SUNRIS = SUNSET = 24.0
ORATIO - REAL Variable (Output) - 72 km MSIS/NRL O atom ratio
TMPEXO - REAL Variable (Output) - Exospheric temperature (K)
IFUAT - INTEGER Variable (Output) - Output file index

INTRINSIC and EXTERNAL Declarations:

DOUBLE PRECISION EPHTIM
INTRINSIC REAL,MOD
EXTERNAL MDRI,EPHTIM,CALEND

Local Variable Declarations:

INTEGER JULDAY
REAL DYDAY,UT,XLST

COMMON Blocks: None
BLOCK DATA NRLBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /NRLDEV/, /NRLFIL/, /SPECIE/

SUBROUTINE RDMDTN

Argument Declarations:

IFILE - INTEGER Variable (Input) - File number
FILENM - CHARACTER*(*) Variable (Input) - MOSART input file name

PARAMETER Declarations:

INTEGER NGMAX, NVMSMAX, MLUSR, MOLMAX
PARAMETER (NGMAX=15, NVMSMAX=20, MLUSR=34, MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
INTRINSIC REAL, MIN, AINT
EXTERNAL PROMPT, INPTBD, CNVJTK, IOERR

Local Variable Declarations:

INTEGER I, J, K, L, IV1, IV2, IDV, IFWHM, IRPT, IVS, IGEOM, IS, IN, ID, MODEL, ITYPE, IEMSCT, M1, M2, M3, M4, M5, M6, MDEF, IRD1, IRD2, IM, NOPRT, IHAZE, ISER, IVULCN, IG, ICSTL, ICLD, IVSA, IREG(4), IMULT, NGEOM, NVS, ISEED, IYEAR, IDAY, ISOURC, ML, IFARM, IPH, NANGLS, NATM(0:7), NVS1, NVS2, NCLD(0:11), IOS, MP, MT, IHA1 (MLUSR), ICLD1 (MLUSR), IVUL1 (MLUSR), ISER1 (MLUSR), ICHR1 (MLUSR), KNDX(20, MLUSR), IEAERO, IZER0, MC (MOLMAX)

REAL TBOUND, SALB, VIS, WSS, WHH, RAINRT, CTHK, CALT, CEXT, HOBS (NGMAX), HSRC (NGMAX), XLAT, XLON, PHIOBS (NGMAX), SLROS (NGMAX), BETAOs (NGMAX), LENP (NGMAX), V1 (NVMSMAX), V2 (NVMSMAX), DV (NVMSMAX), HBCK, SOLDIS, SOLAT, SOLON, AZIM, AVCCON, SOLA2, SOLZEN, AHR, SEC, ZCVSA, ZTVSA, ZERO, CN2, ZINVSA, RO, ANGLEM, AMN, TIME, G, ANGF (50), F (4, 50), AHAZE (MLUSR), EQLWCZ (MLUSR), AZDUM, RRATZ (MLUSR), ZMDL (MLUSR), P (MLUSR), T (MLUSR), WMOL (12, MLUSR), CLALTB (3), CLALT (3)

LOGICAL FLSUB (17), MODTRN
CHARACTER*1 JCHAR (14, MLUSR)
CHARACTER*2 TYGEOM (NGMAX)
CHARACTER*3 RESPON (4)
CHARACTER*6 MONTH
CHARACTER*10 CHGEOM (NGMAX, 5)
CHARACTER*12 CHATM (0:7), CHSEA (0:7), CHAIZE (0:8), CHAER1 (0:10),
CHARACTER*32 TITAER
CHARACTER*40 HEADNG
CHARACTER*72 HMODEL
CHARACTER*80 NFMOPT, DUMMY (8), INSTR (153)

COMMON Blocks: /INPNFX/, /INPTDT/
PARAMETER Declarations:

INTEGER NNMAX, NRMAX, NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MLMAX, MOLMAX, NRPMAX,
NSPECT, NZSH, MLDMX
PARAMETER (NNMAX=3, NRMAX=4, MLMAX=140)
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLDMX=45)
PARAMETER (NRPMAX=80, NSPECT=181, NZSH=361)

INTRINSIC and EXTERNAL Declarations:

REAL GETVAR, SHADOW, FILTER, XTERP, SURFAC
CHARACTER*3 UPCASE
CHARACTER*4 LWCASE
CHARACTER*72 IOERR
INTRINSIC CMPLX, SQRT, COS, SIN, ACOS, ATAN2, REAL, INT, MAX, MIN, ABS
EXTERNAL GETVAR, RDLINE, PARSE, UPCASE, SURFAC, CONFIG,
CNSTNT, SHADOW, FILTER, RDFLTR, DEVCEB, INFLBD,
LWCASE, XTERP, SETFLG, SUMFIL, GETHDR

Local Variable Declarations:

INTEGER I, K, M, N, NBCKZ, ML0, NVAR(NGMAX), IOS,
NN, IGEOM, MM, IV, IVS, IG, NPHI, NTHETA, IP, IT,
IFLTR, MNV, NSFCTP, NZSP, IGRID
REAL XNORM(NGMAX), RINDEX, IINDEX, ZBCK(MLMAX), V, DV,
SWBCK(MLMAX, NGMAX), SIGMAT(NAZMAX),
TBCK(MLMAX, MAXLAT, MAXLON), ZL(MLMAX), A, B,
TAUT(NAZMAX), SIGMET(NAZMAX), TAUSCT(NAZMAX),
RADT(NAZMAX), RADSLT(NAZMAX), RADLNT(NAZMAX),
TAUB(NAZMAX), SIGMEB(NAZMAX), TAUSCB(NAZMAX),
RADB(NAZMAX), DRADT(NAZMAX), DRADB(NAZMAX),
RDSLST(NAZMAX), RDSLSTB(NAZMAX), RADBE(NAZMAX),
RADBR(NAZMAX), RADSD(NAZMAX), FTR, VPM, VPP,
TAUSA(NGMAX, NAZMAX), SKGD(NGMAX, NAZMAX), UP, VP,
TAUSN(NAZMAX, NZSMAX), CNTRST, DUMA2(NAZMAX),
RADSH(NAZMAX, NZSMAX), SNORM(3), PROJA, TNORM,
RADS(NAZMAX, NZSMAX), APPS(NGMAX, NAZMAX),
PATH(NGMAX, NAZMAX), DPHI, DTHETA, ASH(NZSH),
RADSS(NAZMAX, NZSMAX), DAREA, DUM, OBS(3), WL2,
RADSG(NAZMAX, NZSMAX), RANTR, FSH(NSPECT), WL1,
RADSH(NSPECT, NZSH), ECCEN, LATST(MAXLAT),
RSH(NZSH), FSHI(NAZMAX), BW(NGMAX),
BWLG(NGMAX), RSHM(NZSH, NZSH), LONST(MAXLON)

LOGICAL FLTMP
CHARACTER*1 DOT, DUMMY
CHARACTER*24 TFLTR, TFLTR0, TFLTRX, GRID(3), REFT(3), RGH(2)
CHARACTER*25 SHAPE(4)
CHARACTER*40 VRDATA(NGMAX), HEADING, NFFCT
CHARACTER*80 TITLE
CHARACTER*255 VARLAB, FILENM, FILNAM

COMMON Blocks: /CONSTN/, /DEVICE/, /HEADER/, /MATRD/, /MOLEC/, /USERNM/
REAL FUNCTION ROUGH

Argument Declarations:

HSIGMA - REAL Variable - Standard deviation of the heights on the reflective surface
WL - REAL Variable - Wavelength (same units as HSIGMA)
PSI - REAL Variable - Elevation angle at the surface (deg)
ITYPE - INTEGER Variable - Type of surface
ITYPE = 0 implies a plane wave on a Gaussian distribution of stepped surfaces
Otherwise, it implies a spherical wave on a Gaussian distribution of sinusoidal surfaces

INTRINSIC and EXTERNAL Declarations:

REAL      EHBSL0
INTRINSIC SIN, EXP
EXTERNAL   EHBSL0

Local Variable Declarations:

REAL      DUM

COMMON Blocks: /CONSTN/
REAL FUNCTION SURFAC

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm⁻¹)
DV - REAL Variable (Input) - Wavenumber increment (cm⁻¹)
XNORM - REAL Vector (Len = Unspecified) - Surface normal vector
HSOLAR - REAL Variable - Spectral solar irradiance (W/cm²/cm⁻¹)
SOLAZ - REAL Variable - Azimuth angle of incident solar radiation (deg)
SOLEV - REAL Variable - Elevation angle of incident solar radiation (deg)
HLUNAR - REAL Variable - Spectral lunar irradiance (W/cm²/cm⁻¹)
XLUNAZ - REAL Variable - Azimuth angle of incident lunar radiation (deg)
XLUNEV - REAL Variable - Elevation angle of incident lunar radiation (deg)
HSHINE - REAL Array (Dim = NASMAX x Unspecified) - Skyshine radiance (W/cm²/sr/cm²)
PHISH - REAL Vector (Len = Unspecified) - Skyshine elevation angles (deg)
NASPCT - INTEGER Variable - Number of skyshine elevation angles
NASMAX - INTEGER Variable - Maximum number of skyshine elevation angles
AZSH - REAL Vector (Len = Unspecified) - Skyshine azimuth angles (deg)
NAZSH - INTEGER Variable - Number of skyshine azimuths
TAU - REAL Variable - Transmittance observer-facet
TAIR - REAL Variable - Air temperature (K)
PHIRF - REAL Variable - Elevation angle of reflected line of sight at the facet (deg)
AZIM - REAL Variable - Observer azimuthal angle (deg)

PARAMETER Declarations:

INTEGER NRFMAX
PARAMETER (NRFMAX=80)

INTRINSIC and EXTERNAL Declarations:

REAL COMPLEX XTERP, PLANCK, BDRF, SHADOW, ROUGH
REFEST
INTRINSIC SQRT, REAL, DBLE, DPIND, ABS, SIN, COS, MAX, MIN, CMPLX, ATAN2, ACOS, ASIN
EXTERNAL XTERP, PLANCK, FRESNL, BDRF, REFEST, DIREMS, PROFAC, ROUGH

Local Variable Declarations:

INTEGER I, K, ITRPO, KEY, KEYP, M, MM, MP, MMD, MNP, NAYER
REAL WL, REFLS, REFL, RFN, EMIS, PLK, FAC, AZLUN,
REFLX, EMV, EMH, TMPLYR (0:3), UOBS (3), USOL (3),
ULUN (3), POBS, PSOL, PLUN, XOBS, XSOL, XLUN, AZSOL,
SLOPE, SHDWS, SHDWL, XOS, XOL, USHN (3), XSHN,
YNORM, YNORMS, YNORML, FRACSP, DEP (0:3), ZNORM (3)
DOUBLE PRECISION EM, RF, RTERS, RTERL, RTERSH, DSNP, DAZSH
COMPLEX DIELEC, XMUC, INAIR (2), INMAT (0:2), REFR, EPSX, RH,
RV, TV, TH, EPSA

COMMON Blocks: /CONSTM/, /MATRLD/
SUBROUTINE CKSTAT

Argument Declarations:

X - REAL Variable (Output) - Uninitialized variable
Y - REAL Variable (Output) - Static/dynamic variable

PARAMETER Declarations:

INTEGER NMAX
PARAMETER (NMAX=500)

INTRINSIC and EXTERNAL Declarations:

REAL ZSTAT
INTRINSIC MOD, REAL
EXTERNAL ZSTAT

Local Variable Declarations:

INTEGER ICOUNT, KMOD
REAL Z(NMAX)

COMMON Blocks: None

REAL FUNCTION ZSTAT

Argument Declarations:

I - INTEGER Variable - Counter

Local Variable Declarations:

REAL ZSTOR

COMMON Blocks: None

LOGICAL FUNCTION PLOCOL

Argument Declarations: None

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL IOERR

Local Variable Declarations:

INTEGER IFSCR, II, JJ(5), IOS

COMMON Blocks: None
PROGRAM FPTEST

PARAMETER Declarations:

* INTEGER MOLMAX
  PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

* INTEGER LRECHK
  LOGICAL FLCOL1
  CHARACTER*72 CNSTNT, CONFIG, TITLCR, DEVCBD, PROMPT, IOERR,
                  CKSTAT, FLCOL1, LRECHK

Local Variable Declarations:

* INTEGER I, IOS, NRECL(4)
  INTEGER IERR
  REAL X1, X2, Y1, Y2
  LOGICAL FLINI, FLSTA
  LOGICAL FLREC
  CHARACTER*1 DUMMY
  CHARACTER*32 ENDIAN(2), CMPLMT(0:2)
  CHARACTER*33 UNDFL(0:1)
  CHARACTER*47 ROUND(0:2)
  CHARACTER*80 TITLE

COMMON Blocks: /CONSTN/, /DEVICE/, /MACHIN/
INTEGER FUNCTION LRECHK

Argument Declarations: None

NVAR - INTEGER Variable - Number of variables in record
NTYPE - CHARACTER(*) Variable - Type of variable in record
  1: 'INTEGER' or 'INTEGER*4'
  2: 'INTEGER+1'
  3: 'INTEGER+2'
  4: 'REAL' or 'REAL*4'
  5: 'REAL*8' or 'DOUBLE PRECISION'
  6: 'REAL*16'
  7: 'COMPLEX'
  8: 'COMPLEX*16' or 'DOUBLE COMPLEX'
  9: 'COMPLEX*32'
 10: 'LOGICAL' or 'LOGICAL*4'
 11: 'LOGICAL+1'
 12: 'LOGICAL+2'
 13: 'BYTE'
 14: 'BOOLEAN'
 15: 'CHARACTER'

PARAMETER Declarations:

INTEGER MXLNRC,NLINES
PARAMETER (MXLNRC=16384, NLINES=10)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
INTRINSIC INT,REAL,DBLE,CMPLX,MOD,CHAR,ICHR,MACHA1MAG,
         LEN
CDBL INTRINSIC DCMPLX,DIAMAG
CIBM INTRINSIC QEXT,QCMPLX,QIMAG
EXTERNAL IOERR

Local Variable Declarations:

INTEGER I,J,K,IOS,NRECL,LREC,IFSQ,FSTYPE,ICTH,NLEN,NCH,
       PMTYPE(20),NBYES(20),LRECMN,LRECMX
CIBM INTEGER IEND,LRECL
CINT1 INTEGER*1 I1(MXLNRC)
        INTEGER*2 I2(MXLNRC)
CINT4 INTEGER*4 I4(MXLNRC)
REAL R4(MXLNRC)
CRL4 REAL*4 R4(MXLNRC)
CRL8 REAL*8 R8(MXLNRC)
CIBM REAL*16 R16(MXLNRC)
DOUBLE PRECISION R8(MXLNRC)
           COMPLEX C8(MXLNRC)
CIBM COMPLEX*8 C8(MXLNRC)
CCM16 COMPLEX*16 C16(MXLNRC)
DOUBLE COMPLEX C16(MXLNRC)
CIBM COMPLEX*32 C32(MXLNRC)
LOGICAL L4(MXLNRC),FL4
LOGICAL*1 L1(MXLNRC),FL1
CLOG2 LOGICAL*2
CLOG4 LOGICAL*4 L4(MXLNRC),FL4
CHARACTER*100 CH(MXLNRC)
BYTE B1(MXLNRC)
CUNV BOOLEAN BL(MXLNRC)

COMMON Blocks: None
PROGRAM INSTDB

PARAMETER Declarations:

INTEGER NTEMP, MLIDMX, MOLMAX
PARAMETER (NTEMP=5, MLIDMX=45, MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*1 UPCASE
CHARACTER*72 IOERR
CHARACTER*72 INT, INDEX, LEN, MOD, REAL
CMIL INTRINSIC MVSITS
CMIL EXTERNAL DEVCD, PROMPT, CONFIG, UPCASE, IOERR, MOLBND, LCTRIM, RDSCN
CIBMV EXTERNAL FILEINF

Local Variable Declarations:

INTEGER I, J, K, NREC, IFSEQ, IOS, N, NALT, ICKSUM, LAT, LON,
NMOLC, NMOD, NVA, IVA(30), ICHK, IXN, IDUM, IYM
IBIN(250), IALF(250), IMOL(250), IPARAM(295),
IFREQ(295), IT, IBLK, IBNDWD, IBLOCK, MTEMP, JKB
CINT INTEGER IBK(6,6), IWTR(6,6)
CINT INTEGER IALT(6,6)
CINT INTEGER IALT(6,6), IBK(6,6)
CINT INTEGER IWTR(6,6), IERBMD
CMIL INTEGER IFLD(6,6)
CIBMV INTEGER SD(NTEMP), OD(NTEMP), CD(NTEMP), DUM, V, DV, ALF,
VA(30), VB(30), CIRR, SNOW, TERR, TSRF(2),
CLCV(2, 0:3, 2), XLAT, XLM, CLDRAD(2,3,2),
GMT(2,2), TBAND(NTEMP), SDU(NTEMP, 250),
ODU(NTEMP, 250), ALTIT, FRWTR
CHARACTER*1 RESPON, YES
CHARACTER*10 LBMNTH
CHARACTER*17 MOLNAM(MLIDMX)
CHARACTER*80 FILNM(12), FILNMS, FILNMG, FILNNU
CHARACTER*120 NFILE
LOGICAL DEPALT, FLXST

COMMON Blocks: /DEVCNM/, /DEVICE/

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SUBROUTINE ATMINT

Argument Declarations:

NV - INTEGER Variable (Input) - Number of spectral records
IFLTR - INTEGER Variable (Input) - Filter index
Refer to User Reference Manual for definition.
VF - REAL Variable (Input) - Initial wavenumber (cm⁻¹)
VF - REAL Variable (Input) - Final wavenumber (cm⁻¹)
BW - REAL Variable (Output) - Effective bandwidth (μm)
WVL - REAL Variable (Output) - Effective bandwidth (μm)
NAZ - INTEGER Vector (Len = Unspecified) (Input) - Number of azimuths for each geometry
NAZSH - INTEGER Variable (Input) - Number of skyshine azimuths
NASHPCT - INTEGER Vector (Len = Unspecified) (Input) - Number of sky/earthshine angles
NGEOM - INTEGER Variable (Input) - Number of geometries

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NZSMAX, NMATL, NGMAX, MOLMAX
PARAMETER (NAZMAX=30, NASMAX=15, NZSMAX=4, NMATL=28)
PARAMETER (NGMAX=15, MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
REAL FILTER
EXTERNAL FILTER, DEVCB, IOERR

Local Variable Declaration

INTEGER M, MM, IV, IOS, IGEOM, IG
REAL V, DV, FLTR, TAUT(NAZMAX), SIGMET(NAZMAX),
TAUSCT(NAZMAX), RADT(NAZMAX), TAUB(NAZMAX),
SIGMEB(NAZMAX), TAUSCB(NAZMAX), RADE(NAZMAX),
DRADT(NAZMAX), RADSST(NAZMAX),
RADLSB(NAZMAX), DRADBB(NAZMAX),
RDSLSB(NAZMAX), RDSLST(NAZMAX)

COMMON Blocks: /DEVICE/, /INTSTO/, /MOLNMX/
SUBROUTINE ATMOUT

Argument Declarations:

   VI   - REAL Vector (Len = Unspecified) (Input) - Initial wavenumber (cm⁻¹)
   VF   - REAL Vector (Len = Unspecified) (Input) - Final wavenumber (cm⁻¹)
   IFLTR - INTEGER Variable (Input) - Index for filter response
          IFLTR = 0 implies a square wave response
          IFLTR = 1 implies a user-defined response
   TFLTR - CHARACTER(*) Variable (Input) - Title for user-defined filter
   ISMARY - INTEGER Variable (Input) - Summary index

PARAMETER Declarations:

   INTEGER            NGMAX, NAZMAX, NASMAX, MLMAX, NZSMAX, MAXLAT,
                      MAXLON, NVSMAX, ISMX, MOLMAX
   PARAMETER          (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
   PARAMETER          (MLMAX=140, NVSMAX=20)
   PARAMETER          (MOLMAX=26, ISMX=MOLMAX+8)
   PARAMETER          (MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

   CHARACTER*72       IOERR
   INTRINSIC          ABS
   EXTERNAL           ATMINT, BCKINT, DEVCBD, GETHDR, ATMPRN, BCKPRN,
                      ZROINT, IOERR

Local Variable Declarations:

   INTEGER            IG, IZ, IOS, IVS, ML0, NVAR(NGMAX)
   REAL               BW, BWL, VIP, VFP, ZL(MLMAX), BWB, BWLB,
                      LATST(MAXLAT), LONST(MAXLON)
   LOGICAL            FLBCKZ
   CHARACTER*40       HEADNG, HEADBK
   CHARACTER*80       TITLE

COMMON Blocks:        /BCKDAT/, /CONSTN/, /DEVICE/, /HEADER/
SUBROUTINE BCKINT

Argument Declarations:

NV  - INTEGER Variable (Input) - Number of spectral records
IFLTR  - INTEGER Variable (Input) - Filter index
        Refer to User Reference Manual for definition.
VI  - REAL Variable (Input) - Initial wavenumber (cm⁻¹)
VF  - REAL Variable (Input) - Final wavenumber (cm⁻¹)
BW  - REAL Variable (Output) - Effective bandwidth (cm⁻¹)
BWL - REAL Variable (Output) - Effective bandwidth (μm)
NAZ - INTEGER Vector (Len = Unspecified) (Input) - Number of azimuths
NGEOM - INTEGER Variable (Input) - Number of geometries

PARAMETER Declarations:

INTEGER NAZMAX, MLMAX, MAXLAT, MAXLON, NGMAX, MOLMAX
PARAMETER (NAZMAX=30, MLMAX=140, MAXLAT=3, MAXLON=1)
PARAMETER (NGMAX=15, MOLMAX=25)

INTRINSIC and EXTERNAL Declarations:

REAL FILTER
CHARACTER*72 IOERR
EXTERNAL FILTER, DEVCBD, IOERR

Local Variable Declarations:

INTEGER LB, MM, IV, IOS, IG, IGEOM
REAL DV, FLTR, V, SIGMEZ(NAZMAX, MLMAX),
     TAUSBCZ(NAZMAX, MLMAX), RDSCBZ(NAZMAX, MLMAX),
     RADSBCZ(NAZMAX, MLMAX), DRDADZ(NAZMAX, MLMAX),
     RDSLABZ(NAZMAX, MLMAX), RDLNBZ(NAZMAX, MLMAX),
     TAUBZ(NAZMAX, MLMAX)

COMMON Blocks: /BCKDAT/, /DEVICE/
SUBROUTINE GETHDR

Argument Declarations:

- NFILE - INTEGER Variable (Input) - Device number
- ITYPE - INTEGER Variable (Input) - Type of header
- ZBCK - REAL Vector (Len = Unspecified) (Output) - Altitude grid from the background header (km)
- SWBCK - REAL Array (Dim = MMAX x Unspecified) (Output) - Switch for availability of background data
- TBCK - REAL Array (Dim = MMAX x MAXLAT x Unspecified) (Output) - Background altitude air temperatures (K)
- NBCKZ - INTEGER Variable (Output) - Number of background altitudes
- ZL - REAL Vector (Len = Unspecified) (Output) - Altitude grid (km)
- ML0 - INTEGER Variable (Output) - Number of altitude layers
- NVAR - INTEGER Vector (Len = NGMAX) (Output) - Number of variables in record
- LATST - REAL Vector (Len = Unspecified) (Input) - Latitude grid (deg)
- LONST - REAL Vector (Len = Unspecified) (Input) - Longitude grid (deg)

PARAMETER Declarations:

- INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MMAX, MOLMAX
- PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
- PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
- PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
- PARAMETER (MMAX=140)

INTRINSIC and EXTERNAL Declarations:

- CHARACTER*72 IOERR
- EXTERNAL IOERR

Local Variable Declarations:

- INTEGER L, IZ, IOS, KK, LL, NHDR(2), IGEOM

COMMON Blocks:

/HEADER/
PROGRAM MRFLTR

PARAMETER Declarations:

INTEGER  NGMAX, NAZMAX, NASMAX, MAXLAT, MAXLON, NVSMAX, MLMAX,
          NXMAX, ISMX, NJSMAX, MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NJSMAX=4)
PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20, NXMAX=100)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72  IOERR
INTRINSIC     MAX, MIN
EXTERNAL      CNSTNT, ATMCNT, DEVCBD, INITL, RDLFLTR, SUMPFL,
             GETHDR, SETFLG, CONFIG, PROMPT, DBINIT, IOERR

Local Variable Declarations:

INTEGER  LENP(NGMAX), ISMARY, IISHINE(NGMAX), NXTRA, IFLTR,
        NVAR(NGMAX), IOS, JFILE, ISLPOS, IVS, KFILE
REAL     HXTRA(NXMAX), VI(NVSMAX), VF(NVSMAX), ZBCKZ(MLMAX),
        LATST(MAXLAT), LONST(MAXLON)
CHARACTER*24 TFLTR
CHARACTER*40 HEADNG, FILERT
CHARACTER*80 TITLE

COMMON Blocks:    /BCKDAT/, /DEVICE/, /FLAGS/ , /HEADER/, /INITIAL/

SUBROUTINE AGUTOL

Argument Declarations:

IAXS    - INTEGER Variable (Input) - Number of the axis
         IAXS = 1 implies the left axis
         IAXS = 2 implies the right axis
         IAXS = 3 implies the bottom axis
         IAXS = 4 implies the top axis
FUNS    - REAL Variable (Input) - Value of 'AXIS/s/FUNCTION.'
IDMA    - INTEGER Variable (Input) - Direction of the mapping
VINP    - REAL Variable (Input) - Value in one coordinate system
VOTP    - REAL Variable (Output) - Value in other coordinate system
CHARACTER*(*) FUNCTION APPEND

Argument Declarations:

- STRING1 - CHARACTER*(*) Variable - Root string
- STRING2 - CHARACTER*(*) Variable - Additional string

INTRINSIC and EXTERNAL Declarations:

- INTEGER LENSTR
- INTRINSIC LEN, MIN
- EXTERNAL LENSTR

Local Variable Declarations:

- INTEGER IX, IX1, IX2

COMMON Blocks: None

BLOCK DATA PLTBD

PARAMETER Declarations:

- INTEGER NSMX, MLIDMX
- PARAMETER (MLIDMX=45, NSMX=MLIDMX+8)

COMMON Blocks: /CHRPRM/, /PLTPRM/
SUBROUTINE PLTDRV

Argument Declarations:

IFATM - INTEGER Variable (Input) - Atmosphere file number
IPTRN - INTEGER Variable (Input) - Transmittance file number
HEADING - CHARACTER(*) Variable (Input) - MOSART file header
TITLE - CHARACTER(*) Variable (Input) - MOSART file title
NVG - INTEGER Variable (Input) - Number of spectral points
IGEOM - INTEGER Variable (Input) - Geometry index number
ITYPE - INTEGER Variable (Input) - X-axis index
ITYPE = 1 implies wavelength
ITYPE = 2 implies wavenumber
ISCALE - INTEGER Variable (Input) - X-axis scale index
ISCALE = 1 implies linear
ISCALE = 2 implies logarithmic
RES - REAL Variable (Input) - Resolution (cm⁻¹)
RESWL - REAL Variable (Input) - Resolution (µm)
IVS - INTEGER Variable (Input) - Spectral subset index

PARAMETER Declarations:

INTEGER NUMPTS, NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT,
       MAXLON, ISMX, NVSMAX, NUMCRV, MOLMAX, MLIDMX, NSMX
PARAMETER (NUMPTS=3000, NUMCRV=5)
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (MLIDMX=45, NSMX=MLIDMX+8)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*1 UPCASE
CHARACTER*72 IOERR
CHARACTER*100 APPEND
INTRINSIC MAX, MIN, INDEX, LEN
EXTERNAL IOERR, PROMPT, UPCASE, PLTBD, RDMRST, APPEND,
       CHRCBD
EXTERNAL EZMXY, AGSETC, AGSETI, AGSETF, AGUTOL

Local Variables

INTEGER K, L, IOS, IX, IBOT, ITOP, ILAB(5), NVGM, MDX
REAL ATMINP, RNLLOG
CHARACTER*1 DOLLAR, RESPON
CHARACTER*10 PHTYTP(6)
CHARACTER*46 CHARX
CHARACTER*79 GEMNNM
CHARACTER*100 TITLX, HEADNX, ATMNAM, BGNAM, DUM

COMMON Blocks: /CHRCNM/, /CHRPRM/, /HEADER/, /PLTFRM/, /RMODEAT/

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PROGRAM PLTGEN

PARAMETER Declarations:

  INTEGER    MLMAX, NVMAX, MAXLAT, MAXLON, ISMX, NGMAX, NAZMAX,
               NASMAX, NZSMAX, MOLMAX
PARAMETER    (MLMAX=140, NVMAX=20, MAXLAT=3, MAXLON=1)
PARAMETER    (MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER    (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)

INTRINSIC and EXTERNAL Declarations:

  CHARACTER*2    UPCASE
  CHARACTER*72    IOERR
  INTRINSIC      INDEX, LEN
  EXTERNAL      PLTDRV, GETHDR, PROMPT, CONFIG, IOERR, UPCASE, LCTRIM
  EXTERNAL      OPNGKS, CLSGKS, AGUTOL

Local Variable Declarations:

  INTEGER         K, IOS, IFATM, IVS, NBCKZ, ML0, NVAR(NGMAX), IGEOM,
                  IPTRN, ITYPE, ISCALE
  REAL           ZBCKZ (MLMAX), SWBCK (MLMAX, NGMAX), ZL (MLMAX),
                 TBCK (MLMAX, MAXLAT, MAXLON), RES, RESWL,
                 LATST (MAXLAT), LONST (MAXLON)
  LOGICAL        FLXST
  CHARACTER*2    WLN
  CHARACTER*4    SUFFIX, SUFFIX
  CHARACTER*40   HEADNG, FILERT
  CHARACTER*80   TITLE, FILENM

COMMON Blocks: /HEADER/
SUBROUTINE RDMSTR

Argument Declarations:

IFATM  - INTEGER Variable (Input) - Atmosphere file unit number
IFTRN  - INTEGER Variable (Input) - Transmittance file unit number
NVG    - INTEGER Variable (Input) - Number of spectral points
ITYPE  - INTEGER Variable (Input) - X-axis index
MGEOM  - INTEGER Variable (Input) - Number of geometry
RES    - REAL Variable (Input) - Resolution (cm⁻¹)
RESNL  - REAL Variable (Input) - Resolution (μm)
IVS    - INTEGER Variable (Input) - Spectral subset index

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, MMAX, NUMPTS, NGMAX, NZSMAX,
        MAXLAT, MAXLON, ISMX, NVSMAX, NUMCRV, MOLMAX,
        MLIDMX, NSMX, NDV, NSLTD
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MLMAX=140, MAXLAT=3, MAXLON=1)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (MLIDMX=45, NSMX=MLIDMX+8)
PARAMETER (NUMPTS=3000, NUMCRV=5, NVSMAX=20)
PARAMETER (NDV=200, NSLTD=3*NAZMAX*(1+ISMX))

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
INTRINSIC MAX, MIN, MOD
EXTERNAL IOERR, PLTBD, SLITFN

Local Variable Declarations:

INTEGER J, K, M, N, MW, IOS, IG, IGEOM, JP, JJ, MJ, MJM, IS, JMOD,
        IV, JPM, ISP
REAL DVW, SIGMEB, RADT (NAZMAX), DRADT, RADSLT, RESX, VO,
     RADB (NAZMAX), DRADB, TAUSSH, RADSH, RADSE, RADLNT,
     RADSS, RADSC, RADSLT (NAZMAX), RDSLSB (NAZMAX),
     RADBE (NAZMAX), RADER (NAZMAX), RADS, TAUSCB,
     DVWL, TAUT (NAZMAX), TM (3, NAZMAX, NSMX), TAUUX,
     TAUB (NAZMAX), T2, T3, XSLIT (NSLTD), V (NDV),
     SLIT (NDV, NSLTD), DV (NDV), SUMSLT (NDV)

COMMON Blocks: /HEADER/, /PLTPRM/, /RMDAT/
SUBROUTINE COLOR

Argument Declarations:

- WL - REAL Variable (Input) - Wavelength (μm)
- X - REAL Variable (Output) - First CIE response curve
- Y - REAL Variable (Output) - Second CIE response curve
- Z - REAL Variable (Output) - Third CIE response curve

PARAMETER Declarations:

```
INTEGER MPTS  \( \text{MPTS}=83 \)
```

INTRINSIC and EXTERNAL Declarations:

- INTRINSIC INT, MAX, MIN, REAL

Local Variable Declarations:

```
INTEGER M, MP
REAL XCIE(MPTS), YCIE(MPTS), ZCIE(MPTS), FAC
```

COMMON Blocks: None

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SUBROUTINE HUMAN

Argument Declarations:

- V - REAL Vector (Len = *) (Input) - Wavenumber array (cm⁻¹)
- FILTER - REAL Vector (Len = *) (Output) - Spectral filter (1/w)
- BCKGND - REAL Vector (Len = *) (Input) - Spectral background (W/sr/cm⁻¹)
- NPTS - INTEGER Variable (Input) - Number of spectral points
- WTLUMN - REAL Variable (Output) - Filter normalization (w/l)

INTRINSIC and EXTERNAL Declarations:

- INTRINSIC MAX, MIN, LOG
- REAL XTERP
- EXTERNAL XTERP

Local Variable Declarations:

```
INTEGER I, IV, I1, I2, IVM, IVP
REAL WL(45), RESP(45, 9), BCKLVL(9), CLPW(9), F1, F2, FAC, DV, DUM, BCKINT(9), WLO, CP, FLTLUX
```

COMMON Blocks: None
SUBROUTINE NRMLZ

Argument Declarations:

X - REAL Variable (Input/Output) - First CIE response curve
Y - REAL Variable (Input/Output) - Second CIE response curve
Z - REAL Variable (Input/Output) - Third CIE response curve

Local Variable Declarations:

REAL SUM

COMMON Blocks: None

SUBROUTINE SUMIT

Argument Declarations:

R - REAL Variable (Input/Output) - Summed value with weight FILTER (xx)
RX - REAL Variable (Input/Output) - Summed value with weight X (xx)
RY - REAL Variable (Input/Output) - Summed value with weight Y (xx)
RZ - REAL Variable (Input/Output) - Summed value with weight Z (xx)
RV - REAL Variable (Input) - Spectral function (xx/cm⁻¹)
FILTER - REAL Variable (Input) - Basic filter function
DV - REAL Variable (Input) - Spectral increment (cm⁻¹)
X - REAL Variable (Input) - First CIE response curve
Y - REAL Variable (Input) - Second CIE response curve
Z - REAL Variable (Input) - Third CIE response curve
PARAMETER Declarations:

* INTEGER
  *  NGMAX, NAZMAX, NASMAX, NZSMAX, NVMAX, MLMAX,
  *  MAXLAT, MAXLON, ISMX, NUSMAX, MOLMAX, MLDLNX
  * (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
  * (NVMAX=3600, MOLMAX=26, ISMX=MOLMAX+8)
  * (MLMAX=140, MAXLAT=3, MAXLON=1, NUSMAX=20)
  * (MLDLMX=45)

LOCAL and EXTERNAL Declarations:

* CHARACTER*72  IOERR
* INTRINSIC
  *  REAL, DBLE, SQRT, COS, SIN
* EXTERNAL
  *  CNSTNT, DEVCBD, HUMAN, COLOR, SUMFIL, GETHDR,
  *  NRMNZ, SUMIT, PROMPT, CONFIG, SETFLG, IOERR, FILRT

Local Variable Declarations:

* INTEGER
  *  I, K, M, IOS, IG, IV, MM, IVS, NBCK2, ML00, NVAR(NGMAX),
  *  IGP, IGESOM, IDUM
* REAL
  *  V(NVMAX), DV(NVMAX), FILTER(NVMAX), SGMBT, RADBZ,
  *  ZBCK(MLMAX), SWBCK(MLMAX, NGMAX), WL, RADBT, WL1,
  *  TAU1(NVMAX, NAZMAX), DRADT(NVMAX, NAZMAX), TAU1,
  *  RADS1T(NVMAX, NAZMAX), TAU1SCT(NVMAX, NAZMAX),
  *  RADLT(NVMAX, NAZMAX), TAUB(NVMAX, NAZMAX), TAU2,
  *  STGMBT(NVMAX, NAZMAX), RDCBCK(NVMAX, NAZMAX),
  *  RADSH(NVMAX), SIGMEB(NVMAX, NAZMAX), RDBY, WL2,
  *  TAUSCB(NVMAX, NAZMAX), TAUSH, X, Y, Z, WTMR, RAD1,
  *  RADS(NVMAX, NAZMAX), DRADTT, DRADBT, SGMETT,
  *  RADC(NVMAX, NAZMAX), DRADB(NVMAX, NAZMAX),
  *  RADS(NVMAX, NAZMAX), RADDS(NVMAX, NAZMAX),
  *  DRSLST(NVMAX, NAZMAX), RDSLSB(NVMAX, NAZMAX),
  *  RAD(NVMAX, NAZMAX), RDBX, RDLNT, RSLSTT, RABET,
  *  RADB(E(NVMAX, NAZMAX), RADB(R(NVMAX, NAZMAX), DUM,
  *  RADT(NVMAX, NAZMAX), RAD2, TASC1T, TASC1T, RDSLST,
  *  RADB2, RDSLT, RSDT, BWLX, XP(11), YP(11),
  *  ZP(11), TBCX(MLMAX, MAXLON, MAXLON), ZL(MLMAX),
  *  LSTST(MLMAX), LONST(MAXLON)

DOUBLE PRECISION
*  RE, REPO, REEU

CHARACTER*24  TPFLTR
CHARACTER*40  HEADNG, FIELRT
CHARACTER*45  TLBL(18)
CHARACTER*80  TITLE, FILENAM(14)

COMMON Blocks:

* /CONSTN/, /DEVICE/, /FLAGS/, /HEADER/, /MOLCNP/,
  /USERNM/
PROGRAM FACET

PARAMETER Declarations:

INTEGER
  NNMAX, NRMAX, NAZMAX, NASMAX, NGMAX, NGSMAX, MAXLAT, Maxlon, ISMX, NVSMAX, MLMAX, MLOLMAX, NSPCT, NZSH, MLIDMX

PARAMETER
  (NNMAX=3, NRMAX=4, MLMAX=140)
PARAMETER
  (NGMAX=15, NAZMAX=30, NASMAX=15, NZSH=20)
PARAMETER
  (MAXLAT=3, MAXOL=1, NVSMAX=20)
PARAMETER
  (MLOLMAX=26, ISMX=MLOLMAX+8, MLIDMX=45)
PARAMETER
  (NSPCT=80, NZSH=361)

INTRINSIC and EXTERNAL Declarations:

REAL
  GETVAR, SHADOW, FILTER, XTERP, SURFAC
CHARACTER*3
  UPCASE
CHARACTER*4
  LWCASE
CHARACTER*72
  IOERR
INTRINSIC
  CMPLX, SQRT, COS, SIN, ACOS, ATAN2, REAL, INT, MAX, MIN, ABS
EXTERNAL
  GETVAR, RDLINE, PARSE, UPCASE, SURFAC, CONFIG, CNSTN, SHADOW, FILTER, RDLTR, DEVCBD, INFLBD, LWCASE, XTERP, SETFLG, SUMFLG, GETHDR

Local Variable Declarations:

INTEGER
  I, K, M, N, NBECK, ML0, NVAR(NGMAX), IOS, NN, IGEM, MM, IV, IVS, IG, NPHI, NTHETA, IP, IT, IFLTR, MINV, NSPCT, NZSHP, IGRID
REAL
  XNORM(NNMAX), RINDEX, IINDEX, ZBCK(MLMAX), V, DV, SWBCK(MLMAX, NGMAX), SIGMAT(NAZMAX), TBCK(MLMAX, MAXLAT, MAXOL), ZL(MLMAX), A, B, TAUTC(NAZMAX), SIGMET(NAZMAX), TAUSCT(NAZMAX), RACT(NAZMAX), RADSCT(NAZMAX), RADLNT(NAZMAX), TAUB(NAZMAX), SIGMEB(NAZMAX), TAUSCB(NAZMAX), RADB(NAZMAX), DRADT(NAZMAX), DRADB(NAZMAX), RDSLST(NAZMAX), RDSLSB(NAZMAX), RADB(NAZMAX), RADBV(NAZMAX), RADSD(NAZMAX), FILTR, VFM, VPP, TPSN, TPS, TPSN(NGMAX, NAZMAX), BKGD(NGMAX, NAZMAX), UP, VP, TAUSH(NAZMAX, NZMAX), CNTRST, DUMAX(NZMAX), RADSH(NAZMAX, NZMAX), SNORM(3), PROJA, TNORM, RADSE(NAZMAX, NZMAX), APPS(NGMAX, NAZMAX), PATH(NGMAX, NAZMAX), DPHI, DTHETA, ASH(NZSH), RADSS(NAZMAX, NZMAX), DARIA, DUN, OBS(3), WL2, RADSC(NAZMAX, NZMAX), RCNTR, FSH(NSPCT), WLI, RADSNN(NSPCT, NZSH), ECCEN, LATST(MAXLAT), RSH(NZSH), PSHI(NAZMAX), BW(NGMAX), Bwl(NGMAX), RSHM(NAZMAX, NZSH), LONST(MAXOL)

LOGICAL
  FLTMP
CHARACTER*1
  DOT, DUMMY
CHARACTER*24
  TFLTR, TFLTR0, TFLTRX, GRID(3), REFT(3), RGH(2)
CHARACTER*25
  SHAPE(4)
CHARACTER*40
  VRDATA(NGMAX), HEADNG, NFFCT
CHARACTER*80
  TITLE
CHARACTER*255
  VARIAB, FILENM, FILNAM

COMMON Blocks:
  /CONSTN/, /DEVICE/, /HEADER/, /MATRLD/, /MOLECP/, /USERNM/
REAL FUNCTION ROUGH

Argument Declarations:

- HSIGMA - REAL Variable - Standard deviation of the heights on the reflective surface
- WL - REAL Variable - Wavelength (same units as HSIGMA)
- PSI - REAL Variable - Elevation angle at the surface (deg)
- ITYPE - INTEGER Variable - Type of surface
  - ITYPE = 0 implies a plane wave on a Gaussian distribution of stepped surfaces
  - Otherwise, it implies a spherical wave on a Gaussian distribution of sinusoidal surfaces

INTRINSIC and EXTERNAL Declarations:

- REAL          EHBSL0
- INTRINSIC     SIN, EXP
- EXTERNAL      EHBSL0

Local Variable Declarations:

- REAL          DUM

COMMON Blocks: /CONSTN/

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REAL FUNCTION SURFAC

Argument Declarations:

V       - REAL Variable (Input)  - Wavenumber (cm⁻¹)
DV      - REAL Variable (Input)  - Wavenumber increment (cm⁻¹)
XNORM   - REAL Vector (Len = Unspecified)  - Surface normal vector
          
HSOLAR  - REAL Variable  - Spectral solar irradiance (W/cm²/cm⁻¹)
SOLAZ   - REAL Variable  - Azimuth angle of incident solar radiation (deg)
SOLEV   - REAL Variable  - Elevation angle of incident solar radiation (deg)
          
HLUNAR  - REAL Variable  - Spectral lunar irradiance (W/cm²/cm⁻¹)
XLUNAZ  - REAL Variable  - Azimuth angle of incident lunar radiation (deg)
XLUNEV  - REAL Variable  - Elevation angle of incident lunar radiation (deg)
          
HSHINE  - REAL Array (Dim = NASHAX x Unspecified)  - Skyshine radiance
          (W/cm²/sr/cm⁻¹)
PHISH   - REAL Vector (Len = Unspecified)  - Skyshine elevation angles (deg)

NASPCT  - INTEGER Variable  - Number of skyshine elevation angles
NASHAX  - INTEGER Variable  - Maximum number of skyshine elevation angles
AZSH    - REAL Vector (Len = Unspecified)  - Skyshine azimuth angles (deg)

TAU     - REAL Variable  - Transmittance observer-facet
TAIR    - REAL Variable  - Air temperature (K)

PHIRF   - REAL Variable  - Elevation angle of reflected line of sight at the
          facet (deg)
AZIM    - REAL Variable  - Observer azimuthal angle (deg)

PARAMETER Declarations:

INTEGER   NRFMAX

PARAMETER (NRFMAX=80)

INTRINSIC and EXTERNAL Declarations:

REAL      XTERP, PLANCK, BDRF, SHADOW, ROUGH

COMPLEX   REFEST

INTRINSIC SQRT, REAL, DBLE, DPROD, ABS, SIN, COS, MAX, MIN, CMPLX,
          ATAN2, ACOS, ASIN

EXTERNAL  XTERP, PLANCK, FRESNL, BDRF, REFEST, DIREMS, PROFAC,
          ROUGH

Local Variable Declarations:

INTEGER   I, K, ITRP0, KEY, KEYP, N, MX, MP, MMIN, MNP, NLAYER

REAL      WL, REFPLS, REFLL, RFN, EMIS, PLK, FAC, AZLUN,
          REFLX, EMV, EMH, TEMPYR(0:3), UOBS(3), USOL(3),
          OLUN(3), POBS, PSOL, PLUN, XOBS, XSOL, XLUN, ASOL,
          SLOPE, SHDWS, SHDWL, XOS, XOL, USHN(3), XSHN,
          YNORM, YNORMS, YNORML, FRACSF, DEP(0:3), ZNORM(3)

DOUBLE PRECISION EM, RF, RTERS, RTERL, RTERSH, DSNP, DAZSH

COMPLEX   DIELEC, XMUC, INAIR(2), INMAT(0:2), REFR, EPSX, RH,
          RV, TV, TH, EPSA

COMMON Blocks: /CONSTN/, /MATRLD/
SUBROUTINE COEFF

Argument Declarations:

BUF     - REAL Array (Dim = NX x Unspecified) (Output) - Array containing
          packed scene Fourier coefficients
NX      - INTEGER Variable (Input) - Number of pixels in x direction
NY      - INTEGER Variable (Input) - Number of pixels in y direction
DX      - REAL Variable (Input) - Resolution in x
DY      - REAL Variable (Input) - Resolution in y
K0X     - REAL Variable (Input) - PSD frequency scale in x direction
K0Y     - REAL Variable (Input) - PSD frequency scale in y direction
ALPHA   - REAL Variable (Input) - PSD power law index
VAR     - REAL Variable (Input) - Desired scene variance

INTRINSIC and EXTERNAL Declarations:

REAL GAUS
INTRINSIC SQRT,REAL
EXTERNAL GAUS

Local Variable Declarations:

INTEGER I,J,NX2,NY2,NX1,NY1,T1,J1,IP
REAL    KK,KY,SQRT2,RMAXX,RMAXY,RMAX2,DKAPX,DKAPY,
        PSD2D,STDV,A,B

COMMON Blocks: /CONSTN/

REAL FUNCTION CORF

Argument Declarations:

CORL    - REAL Variable - Correlation length
K0      - REAL Variable - PSD frequency scale
ALPHA   - REAL Variable - PSD power law index

INTRINSIC and EXTERNAL Declarations:

REAL KNU,GAMMA
EXTERNAL KNU,GAMMA

Local Variable Declarations:

REAL NU,X

COMMON Blocks: None
SUBROUTINE FM2D

Argument Declarations:

X    - REAL Array (Dim = NMAX x Unspecified) (Input/Output) - Scene matrix. It assumed that the y-dimension is at least as large as the x-dimension.
N    - INTEGER Variable (Input) - Number of pixels in x direction.
NMAX  - INTEGER Variable (Input) - Maximum x-dimension of X
SIGMA - REAL Variable (Input) - Standard deviation of scene
H    - REAL Variable (Input) - Scaling parameter defined by \( H=3-D \), where D is the fractal dimension
PLADD - LOGICAL Variable (Input) - Switch for determining if random additions are to be included

INTRINSIC and EXTERNAL Declarations:

REAL  GAUS
EXTERNAL GAUS

Local Variable Declarations:

INTEGER IX, IY, ND, ND2, MAXLVL, ISTATE, NM
REAL   DELTA

Statement Function Declarations:

REAL  F3, F4, X0, X1, X2, X3

COMMON Blocks: None

SUBROUTINE FOUR1

Argument Declarations:

PDATA - REAL Vector (Len = Unspecified) (Input/Output) - One-dimensional complex (i.e., the real and imaginary parts adjacent in storage) whose length \( NN=2**K, K \geq 0 \) (if necessary append zeroes to the data). Transform values are returned in array PDATA, replacing the input.
NN    - INTEGER Variable (Input) - Length of PDATA
ISIGN - INTEGER Variable (Input) - +1 or -1 for finite FFT or its inverse. One of these followed by the other results in the original data multiplied by NN.

Local Variable Declarations:

INTEGER I, J, M, N, MMAX, ISTEP
REAL   TEMPR, TEMPI, THETA, SINTH, WSTPR, WSTPI, WR, WI

COMMON Blocks: /CONSTN/
REAL FUNCTION GAMMA

Argument Declarations:

X    - REAL Variable - Argument

INTRINSIC and EXTERNAL Declarations:

INTRINSIC    REAL

Local Variable Declarations:

INTEGER     I,N
REAL         A(5),Y,Y1

COMMON Blocks:     None

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REAL FUNCTION GAUS

Argument Declarations:

STD    - REAL Variable - Standard deviation

INTRINSIC and EXTERNAL Declarations:

EXTERNAL    RUNIF

Local Variable Declarations:

INTEGER     I,N
REAL         T(33),DUM,RAND

COMMON Blocks:     None

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REAL FUNCTION KNU

Argument Declarations:

NU    - REAL Variable - Index
X    - REAL Variable - Argument

INTRINSIC and EXTERNAL Declarations:

REAL         GAMMA
INTRINSIC     MAX,REAL,LOG,EXP
EXTERNAL      GAMMA

Local Variable Declarations:

INTEGER     I,N
REAL         T,T0,DT,SUM,C

COMMON Block Declarations:     /CONSTN/

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SUBROUTINE RUNIF

Argument Declarations:

T - REAL Vector (Len = Unspecified) (Input/Output) - Array of
    ABS(N)+1 random numbers from a previous invocation of
    RUNIF. Whenever N is positive and differs from the old
    N, the table is initialized. The first ABS(N) numbers
    are the table discussed in the reference, and the
    (N+1)-st value is Y. This array may be saved in order
    to restart a sequence.

N - INTEGER Variable (Input) - ABS(N) is the number of random
    numbers in an auxiliary table. Although ABS(N)+1 is the
    number of items in array T. If N is positive and differs
    from its value in the previous invocation, then the table
    is initialized for the new value of N. If N is negative,
    ABS(N) is the number of items in an auxiliary table,
    but the tables are now assumed already to be initialized.
    This option enables the user to save the table T at the
    end of a long computer run and to restart with the same
    sequence. Normally, RUNIF would be called at most
    once with negative N. Subsequent invocations would have
    N positive and of the correct magnitude.

X - REAL Variable (Output) - Random number between 0.0 and 1.0.

INtrinsic and EXTERNAL Declarations:

    REAL        UNI
    INTRINSIC    ABS, INT
    EXTERNAL     UNI

Local Variable Declarations:

    INTEGER      I, J, NOLD
    REAL         DUMMY

COMMON Blocks: None

REAL FUNCTION SCALE

Argument Declarations:

CORL - REAL Variable - Correlation length
ALPHA - REAL Variable - PSD slope

INtrinsic and EXTERNAL Declarations:

    REAL        CORF
    INTRINSIC    EXP
    EXTERNAL     CORF

Local Variable Declarations:

    INTEGER      N
    REAL         C, CON, SCMIN, SCMAX, SCL

COMMON Blocks: None

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PROGRAM SCNGEN

PARAMETER Declarations:

INTEGER NX, NY, NZ, NXP, NYP, NPTS, NXT2, NMATL, NXTILE, NYTILE, NOVX, NOVY
PARAMETER (NX=1024, NY=NX, NXP=NX+1, NYP=NY+1)
PARAMETER (NPTS=NX*NY)
PARAMETER (NXTILE=128, NYTILE=NXTILE)
PARAMETER (NOVX=20, NOVY=NOVX)
PARAMETER (NXT2=2*NX, NZ=1)
PARAMETER (NMATL=100)

INTRINSIC and EXTERNAL Declarations:

INTEGER IGTINT
REAL UNI, SCALE, GETVAR, XTERP
CHARACTER*1 UPCASE
CHARACTER*3 LWCASE
CHARACTER*72 IOERR
INTRINSIC MAX, MIN, REAL, INT, ABS, SIN, LEN
EXTERNAL UNI, SCALE, COEFF, TDFFT, GETVAR, RDLINE, PARSE, FM2D,
          IGTINT, PROMPT, CONFIG, UPVAR, LWCASE, CNSTINT,
          IOERR, TILEDIT, XTERP

Local Variable Declarations:

INTEGER I, IX, IY, IOS, IFSCN, IFINP, IFMSK, NDUM, NCOLM, NROWM,
       INDX(NMATL), IM, NMAT, IXM, IYM, IFCLUD, IXC, IYC,
       NCP, NRCNC, NCOLC, NO, LVAR, NXUSER, NYUSER, NRECL,
       IROW, NGRID
REAL K0X, K0Y, DUM, DX, DY, SEED, SIG, SIGMA, RESMKY, RY,
     ALPHA(0:NMATL), RESMKX, CMIN, VAR(0:NMATL), SCN,
     CNMN(0:NMATL,2), FRCT(NMATL), CMAX, H, PSDPWR,
     XMIN, XMAX, CUMFRC, DPTS, WTMSK(0:NMATL), CLDCVR,
     RESCLD, ELEV, CORLEN(0:NMATL), ROW(NX), TRN,
     RTRAN(NX), RPATH(NX), RSTDV(NX), REFTRN
LOGICAL PLADD, MSKADD, CLDADD, FLGRD
CHARACTER*1 DOT
CHARACTER*20 VRDATA(8)
CHARACTER*40 FILENM
CHARACTER*80 DUMMY
CHARACTER*255 VARIAB, NFSCN, NFMSK, NFCLUD
CHARACTER*1024 BUFF

COMMON Blocks: /CONSTN/, /PIXEL/

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SUBROUTINE TDFFT

Argument Declarations:

BUF      - REAL Array (Dim = NX x Unspecified) (Input/Output) - Upon input, BUF is the packed array of scene Fourier coefficients. Upon output, BUF is the random, correlated background fluctuations.
NX       - INTEGER Variable (Input) - Number of pixels in x direction
NY       - INTEGER Variable (Input) - Number of pixels in y direction
ARR      - REAL Vector (Len = Unspecified) - Work space
UNPCK    - REAL Vector (Len = Unspecified) - Work space

INTRINSIC and EXTERNAL Declarations:

EXTERNAL   FOURI

Local Variable Declarations:

INTEGER          I,I,J,ISGN,NX2,NY2,NSORT,IP,JP,IJ
REAL             SAVE

COMMON Blocks: None

SUBROUTINE TILEIT

Argument Declarations:

X        - REAL Array (Dim = NMAX x Unspecified) (Output) - Large array
NX       - INTEGER Variable (Input) - Number of x-elements for X
NMAX     - INTEGER Variable (Input) - Maximum number of x-elements for X
NY       - INTEGER Variable (Input) - Number of y-elements for X
TILE     - REAL Array (Dim = NTMAX x Unspecified) (Input) - Small array
NTX      - INTEGER Variable (Input) - Number of x-elements for TILE
NTMAX    - INTEGER Variable (Input) - Maximum number of x-elements for TILE
NTY      - INTEGER Variable (Input) - Number of y-elements for TILE
NOVRX    - INTEGER Variable (Input) - Number of overlapping elements at the edge in the x-direction
NOVRY    - INTEGER Variable (Input) - Number of overlapping elements at the edge in the y-direction

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL,MOD

Local Variable Declarations:

INTEGER         IX,IY,ITX1,ITX2,ITY1,ITY2
REAL             FACX,FACY

COMMON Blocks: None
REAL FUNCTION UNI

Argument Declarations:

\[ R \] - REAL Variable - Argument
  If \( R=0 \), the next random number of the sequence is generated.
  If \( R<0 \), the last generated number will be returned for
  possible use in a restart procedure.
  If \( R>0 \), the sequence of random numbers will start with
  the seed \( R \mod 1 \). This seed is also returned as the
  value of UNI provided the arithmetic is done exactly.

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MOD, INT

Local Variable Declarations:

INTEGER IA1, IA0, IA1MA0, IC, IX1, IX0, IY1, IY0

COMMON Blocks: None

INTEGER FUNCTION NCHTER

Argument Declarations:

CHVAR - CHARACTER*(*) Variable - Model atmosphere identifier

PARAMETER Declarations:

INTEGER NMATL
PARAMETER (NMATL=76)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*10 UPCASE
INTRINSIC LEN, MIN
EXTERNAL LCTRIM, UPCASE

Local Variable Declarations:

INTEGER I, J, LMAX
CHARACTER*10 CHTER(0:NMATL,2), CHVARP

COMMON Blocks: None

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SUBROUTINE RDUERMR

Argument Declarations:

INMATL - INTEGER Variable (Input) - Material index
IFILE - INTEGER Variable (Input) - File unit number
IEND - INTEGER Variable (Output) - End of file switch
LABEL - CHARACTER*(*) Variable (Output) - Material label
HTALF - REAL Variable (Output) - Solar absorptivity
HTEP - REAL Variable (Output) - Thermal emissivity
CHRLN - REAL Variable (Output) - Characteristic length (m)
HMTPL - INTEGER Variable (Output) - Heat calculation flag
SPHT - REAL Variable (Output) - Specific heat (W-sec/gm/K)
HCND - REAL Variable (Output) - Thermal conductivity (W/m/K)
DNSTY - REAL Variable (Output) - Density (gm/m³)
ZLYRR - REAL Vector (Len = Unspecified) (Output) - Layer thickness (m)
INLYR - INTEGER Vector (Len = Unspecified) (Output) - Layer index

PARAMETER Declarations:

INTEGER NMATL, MAXLAT, MAXLON
PARAMETER (NMATL=76, MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

INTEGER NCHTER
REAL GETVAR
CHARACTER*3 UPCASE
EXTERNAL GETVAR, RDLINE, UPCASE, BKGDBD, NCHTER

Local Variable Declarations:

INTEGER MTLDEF
CHARACTER*255 VARIAB

COMMON Blocks: /BACKGD/
PROGRAM TETM

PARAMETER Declarations:

INTEGER NMATL, NTIME, NLAGER, MAXLAT, MAXLON, MOLMAX, NALTMX,
MSURF, NGMAX, MLMAX, NSLPMX, NAZMAX, NASMAX, ISMX,
NZMAX, NVSMAX, MLIDMX, NL
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZMAX=4)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER (NVSMAX=20, NALTMAX=76, NTIME=500, MLMAX=140)
PARAMETER (NLAGER=20, NALTMAX=11, MSURF=14, NSLPMX=3)
PARAMETER (MAXLAT=3, MAXLON=1, MLIDMX=45)
PARAMETER (NL=50)

INTRINSIC and EXTERNAL Declarations:

INTEGER IGINT
REAL SEATMP, XTERP, GETVAR, SATTR
CHARACTER*3 UPCASE
CHARACTER*4 LWCASE
CHARACTER*72 IOERR
INTRINSIC SIN, MAX, MIN, REAL, ABS, COS, SQRT, MOD
EXTERNAL CNSTNT, CONFIG, FILRT, GETHDR, GETVAR, GETVEC, HTCBLNC,
IGINT, INTR2D, IOERR, PARSE, EXMLBD, PROFAC, PROMPT,
RDLINE, SEATMP, SPCLYR, UPCASE, XTERP, DEVCBM, BKGDDB,
CHRCB, SATUR, ATMSBD, LWCASE, RDSRMI, RSCALC

Local Variable Declarations:

INTEGER I, J, K, L, M, MTL, ITM, NSTAB, IOS, KK, LL, IDUM, LLY,
NCNTZ, ML0, NVAR (NGMAX), NALT, NSLP, NSURF, NTMP,
KEYT, KEYTP, NVARMX, NVARX, SCNDX (22), JJ, MLXL, KS, NMTLT, NMTL0, NTM
REAL DECTIM (NTIME), DELTM, RFDS (NALTMX, NTIME, MSURF),
SOLA (NTIME), SOLEV (NTIME), ALT (NALTMX),
LTMP (NTIME), TSRF (NALTMX, NTIME, NALTML, MSURF),
TAILC (NALTMX, NTIME), STABRS, TSSL (NALTMX),
TLVR (10, NTIME), FACT (MAXLAT, MAXLON), BS, W,
WINDL (NALTMX, NTIME), PAIRLC (NALTMX, NTIME),
TLVR (0:NLAYER+1), BS, WS, DTMAX,
SPHLYR (0:NLAYER+1), DNLV (0:NLAYER+1),
HPLVRL (0:NLAYER+1), ZLAYR (0:NLAYER+1), BS, W,
DNLV (2, NLAYER+1), YNORM (3),
XNORM (3, MSURF), PLVR (10, NTIME), AZM (4), DSWI,
BSWZL (10, NTIME), DSWZL (10, NTIME), DSW1, DSW2,
DLWZL (10, NTIME), BS, DS (NALTMX, NTIME), DLW1,
DLW (NALTMX, NTIME), VNLWVR (10, NTIME), DLWF, DSWF,
ZLVR (10), ULWZ (10), DLWZ (10), DLM1, DLM2, SOLAZI,
USWZ (10), DSWZ (10), BS (10), FTETMP (NALTMX),
ZBECK (1), SWBK (MLMAX, 1), TBCK (MLMAX, MAXLAT, 1),
ZL (1), SLOPE (NSLPMX), SOLEVI, SOLAZF, SOLEVF,
RFDSI, RFDSF, TAI1, TAI2, TAI4, TAI4F, FACTIM,
PAIR1, PAIR2, PAIR4, PAIR5, WINDE1, WINDE2, WIND3,
WIND4, AUTX, SLXV, SLAY, TIMEP, TFINAL, TINIT,
TIMEL, SCNMCP (4, NMTL), HLYR (10, NTIME),
TMPCP (NALTMX, NTIME, MSURF, 4), CMOL (MLIDMX),
SUMC, RHX, CH20 (10, NTIME)
LOGICAL FLSUN, FLINI, FLUSR
CHARACTER*1 DOT
CHARACTER*40 HEADING, FILERT, VRSUB (8)
CHARACTER*80 TITLE, FILENM (19), FILNM, DUMMY
CHARACTER*255 VARIAB

COMMON Blocks:

/ATMDAT/, ,BACKGSD/, ,CHRCBM/, ,CNSTNT/, ,DEVICE/, ,EXTMOL/, ,HEADER/
4.2 Static Variables

All local variables, with the exceptions noted below, are dynamic (except for variables initialized by a DATA statement). All COMMON blocks are SAVED in each routine in which the COMMON block appears; hence, all variables in COMMON blocks are static.

As stated above, a few local variables are static (via a SAVE statement). These variables and their routines are:

SUBROUTINE ABSMOL: VDUM, IBIN, IMOL, SDZ, IALF, ODZ, NRECU

SUBROUTINE BMOD: ISWX, KEYWL, KEYMLP, FAC, TS, TSS, AD0, MLOLD, PRTN0

SUBROUTINE CKSTAT: ICOUNT

SUBROUTINE CXDTA: IND

REAL FUNCTION GAUS: T

SUBROUTINE MIEPHS: ISWTCH, PCTP

SUBROUTINE MLSCAT: TAPU, SCTI, SCT3

SUBROUTINE PHFUNC: WLY, JWLI, JWLP, FACWL

SUBROUTINE PHYDRO: WLY, KWL, KWLP, FACTP

SUBROUTINE PHTOSB: PLK1, DPLK1

SUBROUTINE RAINSP: KEYWL

SUBROUTINE RDBG: IPRINT

SUBROUTINE RDSCL: IPRINT

SUBROUTINE RUNIF: NOLD

SUBROUTINE SETBCK: ISTORE

SUBROUTINE SNOWSP: KEYWL

SUBROUTINE STRCNZ: CN2BCK, VV0

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REAL FUNCTION UNI:  IX1, IX0
REAL FUNCTION XTERP:  KEY
REAL FUNCTION ZODICL:  ISW, NORDER, RT, WT
5.0 COMMON BLOCK DATA DICTIONARY

The data dictionary for the COMMON blocks in the MOSART program and related utility codes follow. A brief summary of the COMMON block contents is included, together with a list of routines in which the block occurs. Each variable is listed by name, array size (if applicable), variable type, and a description. See the PARAMETER Data Dictionary for those arrays whose size is defined by a PARAMETER constant.

All COMMON blocks are SAVEd in each routine in which it appears, so all of the variables are static.
AEROSL

This COMMON block contains the aerosol model parameters and the phase functions for the various atmospheric components.

Common Block AEROSL used in:
AEROSL   ARSLBD   BBARSL   BNDPAR   HYDROM   MARINE
PHFUNC   PHYDRO   PRCALC   RSHINE

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
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<tbody>
<tr>
<td>WLA(NWLCLD)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>NRH(30)</td>
<td>INTEGER</td>
<td>Number of relative humidity values</td>
</tr>
<tr>
<td>RHP(4,30)</td>
<td>REAL</td>
<td>Relative humidity</td>
</tr>
<tr>
<td>ANGLE(NANG)</td>
<td>REAL</td>
<td>Scattering angles (deg)</td>
</tr>
<tr>
<td>SCPHA(NANG)</td>
<td>REAL</td>
<td>Aerosol phase function (sr⁻¹)</td>
</tr>
<tr>
<td>SCPHH(NANG)</td>
<td>REAL</td>
<td>Hydrometer phase function (sr⁻¹)</td>
</tr>
<tr>
<td>ASYMDF(47)</td>
<td>REAL</td>
<td>Asymmetry factor</td>
</tr>
<tr>
<td>TMPAMM (4)</td>
<td>REAL</td>
<td>Water cloud temperatures (K)</td>
</tr>
<tr>
<td>TMPIMM (4)</td>
<td>REAL</td>
<td>Ice cloud temperatures (K)</td>
</tr>
<tr>
<td>NTMP (30)</td>
<td>INTEGER</td>
<td>Number of temperatures used for a cloud</td>
</tr>
</tbody>
</table>
AERSCA

This COMMON block contains the absorption and scattering coefficients for the atmospheric aerosols as a function of wavelength and altitude, together with the keys and proportionality factors for relative humidity.

Common Block AERSCA used in:
- AERSOL
- BBARSL
- BNDPAR
- PHFUNC

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCAERO(NWLAER, MLMAX)</td>
<td>REAL</td>
<td>Aerosol scattering coefficient (km(^{-1})) as a function of wavelength and altitude</td>
</tr>
<tr>
<td>ABAERO(NWLAER, MLMAX)</td>
<td>REAL</td>
<td>Aerosol absorption coefficient (km(^{-1})) as a function of wavelength and altitude</td>
</tr>
<tr>
<td>JRH(MLMAX)</td>
<td>INTEGER</td>
<td>First index for relative humidity</td>
</tr>
<tr>
<td>JRHP(MLMAX)</td>
<td>INTEGER</td>
<td>Second index for relative humidity</td>
</tr>
<tr>
<td>FACRH(MLMAX)</td>
<td>REAL</td>
<td>Proportional value between first and second indices</td>
</tr>
</tbody>
</table>
AERSCC

This COMMON block contains the absorption and scattering coefficients as a function of wavelength and altitude.

Common Block AERSCC used in:
   BNDPAR   HYDROM

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABCLOU(NWLCLD,</td>
<td>REAL</td>
<td>Water cloud absorption coefficient (km$^{-1}$) as a function of wavelength and altitude</td>
</tr>
<tr>
<td>MLMAX)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCCLOU(NWLCLD,</td>
<td>REAL</td>
<td>Water cloud scattering coefficient (km$^{-1}$) as a function of wavelength and altitude</td>
</tr>
<tr>
<td>MLMAX)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABCIRR(NWLCLD,</td>
<td>REAL</td>
<td>Cirrus cloud absorption coefficient (km$^{-1}$) as a function of wavelength and altitude</td>
</tr>
<tr>
<td>MLMAX)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCCIRR(NWLCLD,</td>
<td>REAL</td>
<td>Cirrus cloud scattering coefficient (km$^{-1}$) as a function of wavelength and altitude</td>
</tr>
<tr>
<td>MLMAX)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABCICE(NWLCLD,</td>
<td>REAL</td>
<td>Ice cloud absorption coefficient (km$^{-1}$) as a function of wavelength and altitude</td>
</tr>
<tr>
<td>MLMAX)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCCICE(NWLCLD,</td>
<td>REAL</td>
<td>Ice cloud scattering coefficient (km$^{-1}$) as a function of wavelength and altitude</td>
</tr>
<tr>
<td>MLMAX)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
AERSLA

This COMMON block contains the aerosol and hydrometeor absorption coefficients.

Common Block AERSLA used in:
   AERSOL   ARSABD   HYDROM   MARINE

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA(NWLCLD,30,4)</td>
<td>REAL</td>
<td>Aerosol absorption coefficients (normalized)</td>
</tr>
</tbody>
</table>
AERSLX

This COMMON block contains the aerosol and hydrometeor extinction coefficients.

Common Block AERSLX used in:
- AERSOL
- ARSXBD
- HYDROM
- MARINE

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CX(NWLCLD,30,4)</td>
<td>REAL</td>
<td>Aerosol extinction coefficients normalized to unity at 0.55 μm</td>
</tr>
</tbody>
</table>
AERUSR

This COMMON block contains the parameters for the user-defined aerosol model.

Common Block AERUSR used in:
   AERSOL   PHFUNC

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAERO(NWLAER, MLMAX)</td>
<td>REAL</td>
<td>User-defined aerosol asymmetry factor as a function of wavelength and altitude</td>
</tr>
<tr>
<td>GUSER(NWLAER)</td>
<td>REAL</td>
<td>User-defined aerosol asymmetry factor corresponding to PHUSER</td>
</tr>
<tr>
<td>PHUSER(4,NANG, NWLAER)</td>
<td>REAL</td>
<td>User-defined aerosol phase function (polarization terms included)</td>
</tr>
</tbody>
</table>
**ANTECD**

This COMMON block contains the 24-hour antecedent parameters for the heat balance calculations.

Common Block ANTECD used in:
- BRBNDR
- DEFLT
- INITL

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NANTE</td>
<td>INTEGER</td>
<td>Number of points</td>
</tr>
<tr>
<td>AHR(NANTMX)</td>
<td>REAL</td>
<td>Hour of day (deg.)</td>
</tr>
<tr>
<td>ATMP(NANTMX)</td>
<td>REAL</td>
<td>Air temperature (K)</td>
</tr>
<tr>
<td>ARH(NANTMX)</td>
<td>REAL</td>
<td>Relative humidity (fraction)</td>
</tr>
<tr>
<td>AWND(NANTMX)</td>
<td>REAL</td>
<td>Wind speed (m/sec)</td>
</tr>
<tr>
<td>APRS(NANTMX)</td>
<td>REAL</td>
<td>Pressure (mb)</td>
</tr>
<tr>
<td>ACLCV(NANTMX,3)</td>
<td>REAL</td>
<td>Low/mid/high etage cloud cover</td>
</tr>
<tr>
<td>ACLBS(NANTMX,3)</td>
<td>REAL</td>
<td>Low/mid/high etage cloud base altitude (km)</td>
</tr>
<tr>
<td>ACLTP(NANTMX,3)</td>
<td>REAL</td>
<td>Low/mid/high etage cloud top altitude (km)</td>
</tr>
<tr>
<td>ISWANT</td>
<td>INTEGER</td>
<td>Antecedent data switch</td>
</tr>
</tbody>
</table>
**ARSLSC**

This COMMON block contains various parameters used for the aerosol scattering calculations.

Common Block ARSLSC used in:
- BNDPAR
- INICPL
- MLSCAT
- PHFUNC
- PRCALC
- PTHOSB
- RSHINE

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCATTR(NANG,</td>
<td>REAL</td>
<td>Scatter term equal to scatter coefficient times the phase function divided by 4*PI (km⁻¹ sr⁻¹)</td>
</tr>
<tr>
<td>MAXLAT,MAXLON,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MLMAX)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCTVAR(NANG,</td>
<td>REAL</td>
<td>Combined asymmetry factor</td>
</tr>
<tr>
<td>MAXLAT,MAXLON,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MLMAX)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASYM(MLMAX,</td>
<td>REAL</td>
<td>Aerosol asymmetry factor</td>
</tr>
<tr>
<td>MAXLAT,MAXLON)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASYMA(MLMAX,</td>
<td>REAL</td>
<td></td>
</tr>
<tr>
<td>MAXLAT,MAXLON)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCATOT(MLMAX,</td>
<td>REAL</td>
<td>Combined scattering coefficient</td>
</tr>
<tr>
<td>MAXLAT,MAXLON)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(km⁻¹)</td>
</tr>
</tbody>
</table>
**ATMDAT**

This COMMON block contains the model atmosphere parameters.

Common Block ATMDAT used in:

<table>
<thead>
<tr>
<th>ATMPRN</th>
<th>ATMSBD</th>
<th>BCKPRN</th>
<th>BRBNDR</th>
<th>CALCUL</th>
<th>CIRRUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFLT2</td>
<td>EQABS</td>
<td>EQUABS</td>
<td>INITL</td>
<td>PRCALC</td>
<td>SCNRIO</td>
</tr>
<tr>
<td>SETALT</td>
<td>SETBCK</td>
<td>SHNGEO</td>
<td>SRCGEO</td>
<td>SRCIRR</td>
<td>USRDEF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>REBAR</td>
<td>DOUBLE PRECISION</td>
<td>Mean radius of the earth (km)</td>
</tr>
<tr>
<td>REPOL</td>
<td>DOUBLE PRECISION</td>
<td>Polar radius of the earth (km)</td>
</tr>
<tr>
<td>REEQU</td>
<td>DOUBLE PRECISION</td>
<td>Equatorial radius of the earth (km)</td>
</tr>
<tr>
<td>Z(NL)</td>
<td>REAL</td>
<td>Altitude (km)</td>
</tr>
<tr>
<td>P(NL,24)</td>
<td>REAL</td>
<td>Pressure (mb)</td>
</tr>
<tr>
<td>T(NL,24)</td>
<td>REAL</td>
<td>Temperature (K)</td>
</tr>
<tr>
<td>LATIT(24)</td>
<td>REAL</td>
<td>Latitude (deg)</td>
</tr>
<tr>
<td>WINDEF(24)</td>
<td>REAL</td>
<td>Effective wind speed (m/sec)</td>
</tr>
<tr>
<td>LATST(MAXLAT)</td>
<td>REAL</td>
<td>Storage for model atmosphere latitude (deg)</td>
</tr>
<tr>
<td>LATST(MAXLON)</td>
<td>REAL</td>
<td>Storage for model atmosphere longitude (deg)</td>
</tr>
</tbody>
</table>
**BACKGD**

This COMMON block contains the material reflectivity and temperature parameters and the scene composition parameters.

Common Block BACKGD used in:
- ATMPRN
- BCKGND
- BKGDBD
- BRBNDR
- COUPLE
- GETBCK
- INITL
- SETBCK
- SPCLYR
- USRBCK

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWLBK(NMATL)</td>
<td>INTEGER</td>
<td>Number of wavelengths</td>
</tr>
<tr>
<td>WLGBKGD(90,NMATL)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>NMATRL</td>
<td>INTEGER</td>
<td>Number of materials</td>
</tr>
<tr>
<td>REFLEC(90,NMATL)</td>
<td>REAL</td>
<td>Hemispherical average reflectivity</td>
</tr>
<tr>
<td>IBKTPY(NMATL)</td>
<td>INTEGER</td>
<td>Background reflection index</td>
</tr>
<tr>
<td>FRDIF(NMATL)</td>
<td>REAL</td>
<td>Fraction of background reflection that is diffuse</td>
</tr>
<tr>
<td>BKRGH(NMATL)</td>
<td>REAL</td>
<td>Roughness standard deviation (m)</td>
</tr>
<tr>
<td>CORREL(NMATL)</td>
<td>REAL</td>
<td>Roughness correlation length (m)</td>
</tr>
<tr>
<td>IRGH(NMATL)</td>
<td>INTEGER</td>
<td>Roughness index</td>
</tr>
<tr>
<td>FINC(NMATL)</td>
<td>REAL</td>
<td>Fraction of air mixed with material</td>
</tr>
<tr>
<td>ITINC(NMATL)</td>
<td>INTEGER</td>
<td>Type of inclusion</td>
</tr>
<tr>
<td>KMATL</td>
<td>INTEGER</td>
<td>Number of materials in scene</td>
</tr>
<tr>
<td>INDEXB(NMATL)</td>
<td>INTEGER</td>
<td>Material index</td>
</tr>
<tr>
<td>FRACT(NMATL)</td>
<td>REAL</td>
<td>Fraction of material defined by INDEX in scene</td>
</tr>
<tr>
<td>TEMPM(NAMTL,6)</td>
<td>REAL</td>
<td>Temperature (K) of each material in sunlight and in shade</td>
</tr>
<tr>
<td>MAXLAT,MAXLON)</td>
<td>REAL</td>
<td></td>
</tr>
<tr>
<td>IHTFLG(NMATL)</td>
<td>INTEGER</td>
<td>Heat balance calculation index</td>
</tr>
<tr>
<td>HTALPH(NMATL)</td>
<td>REAL</td>
<td>Solar absorptivity</td>
</tr>
<tr>
<td>HTEPS(NMATL)</td>
<td>REAL</td>
<td>Thermal emissivity</td>
</tr>
<tr>
<td>HTCOND(NMATL)</td>
<td>REAL</td>
<td>Conduction coefficient (W/m²/K)</td>
</tr>
<tr>
<td>CHARLN(NMATL)</td>
<td>REAL</td>
<td>Convective characteristic length (m)</td>
</tr>
<tr>
<td>SPHEAT(NMATL)</td>
<td>REAL</td>
<td>Specific heat (W·sec/gm/K)</td>
</tr>
<tr>
<td>DENTSY(NMATL)</td>
<td>REAL</td>
<td>Density (gm/m³)</td>
</tr>
<tr>
<td>STDVSC(NMATL)</td>
<td>REAL</td>
<td>Standard deviation of the material defined by INDEX divided by the mean</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZHLYR(2,NMATL)</td>
<td>REAL</td>
<td>Layer thickness (m)</td>
</tr>
<tr>
<td>NWLUSR</td>
<td>INTEGER</td>
<td>Number of spectral points for user-defined materials</td>
</tr>
<tr>
<td>WLUSR(100)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>REFUSR(100,3) REAL</td>
<td></td>
<td>User-defined diffuse reflectivity</td>
</tr>
<tr>
<td>WAVEHT(MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Sea wave height (m)</td>
</tr>
<tr>
<td>SLOPEW(MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Sea rms wave slope</td>
</tr>
<tr>
<td>FOAM(MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Fraction of foam</td>
</tr>
<tr>
<td>INDLYR(3,NMATL)</td>
<td>INTEGER</td>
<td>Indices of layers</td>
</tr>
</tbody>
</table>
BCKDAT

This COMMON block contains the parameters for the paths to each background altitude.

Common Block BCKDAT used in:
BCKPRN  EQUABS  INTEG  KDISTR  PRCALC  PUTHDR
SCNRIO  ZROINT  ATMOUT  BCKINT  MRFLTR

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBCKZ</td>
<td>INTEGER</td>
<td>Number of background altitudes</td>
</tr>
<tr>
<td>LBCKXX(MLMAX)</td>
<td>INTEGER</td>
<td>Background altitude indices</td>
</tr>
<tr>
<td>ZBCK(MLMAX)</td>
<td>REAL</td>
<td>Altitude (km)</td>
</tr>
<tr>
<td>TAUBZT(NAZMAX, MLMAX, NGMAX)</td>
<td>REAL</td>
<td>Running integral of transmission at altitude</td>
</tr>
<tr>
<td>RADBZT(NAZMAX, MLMAX, NGMAX)</td>
<td>REAL</td>
<td>Running integral of thermal path radiance to background (W/cm²/sr)</td>
</tr>
<tr>
<td>RSLBZT(NAZMAX, MLMAX, NGMAX)</td>
<td>REAL</td>
<td>Running integral of Apparent solar irradiance at background (W/cm²)</td>
</tr>
<tr>
<td>RLNBZT(NAZMAX, MLMAX, NGMAX)</td>
<td>REAL</td>
<td>Running integral of apparent lunar irradiance at background (W/cm²)</td>
</tr>
<tr>
<td>RSCBZT(NAZMAX, MLMAX, NGMAX)</td>
<td>REAL</td>
<td>Running integral of scattered path radiance to background (W/cm²/sr)</td>
</tr>
<tr>
<td>RADSHB(NAZMAX, MLMAX)</td>
<td>REAL</td>
<td>Upper thermal skyshine irradiance at background (W/cm²/cm⁻¹)</td>
</tr>
<tr>
<td>RDSHBT(NAZMAX, MLMAX, NGMAX)</td>
<td>REAL</td>
<td>Running integral of upper thermal skyshine irradiance at background (W/cm²)</td>
</tr>
<tr>
<td>Variable</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------</td>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>RDSHSB(NAZMAX, MLMAX)</td>
<td>REAL</td>
<td>Upper scattered skyshine irradiance at background (W/cm²/cm⁻¹)</td>
</tr>
<tr>
<td>RSHSBT(NAZMAX, MLMAX, NGMAX)</td>
<td>REAL</td>
<td>Running integral of upper scattered skyshine irradiance at background (W/cm²)</td>
</tr>
<tr>
<td>SGMEZT(NAZMAX, MLMAX, NGMAX)</td>
<td>REAL</td>
<td>Running integral of scintillation at background</td>
</tr>
<tr>
<td>TASCZT(NAZMAX, MLMAX, NGMAX)</td>
<td>REAL</td>
<td>Running integral of in-scattered transmittance</td>
</tr>
<tr>
<td>DRADZT(NAZMAX, MLMAX, NGMAX)</td>
<td>REAL</td>
<td>Running integral of standard deviation of the thermal path radiance</td>
</tr>
<tr>
<td>SWBCK(MLMAX, NGMAX)</td>
<td>REAL</td>
<td>Switch for availability of background parameters</td>
</tr>
<tr>
<td>TBCK(MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Temperature at background (K)</td>
</tr>
<tr>
<td>LZ(MLMAX, NGMAX)</td>
<td>INTEGER</td>
<td>Altitude indices</td>
</tr>
</tbody>
</table>
BRBNDT

This COMMON block contains the altitude and time dependent heat fluxes.

Common Block BRBNDT used in:
   BRBNDR   SRCFLX

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZLYR(10)</td>
<td>REAL</td>
<td>Altitude (km)</td>
</tr>
<tr>
<td>TLBR(101)</td>
<td>REAL</td>
<td>Temperature (K)</td>
</tr>
<tr>
<td>PLBR(101)</td>
<td>REAL</td>
<td>Pressure (mb)</td>
</tr>
<tr>
<td>RHLYER(10,NTIME)</td>
<td>REAL</td>
<td>Relative humidity</td>
</tr>
<tr>
<td>ULWZ(10,NTIME)</td>
<td>REAL</td>
<td>Upward long-wave flux (W/m²)</td>
</tr>
<tr>
<td>DLWZ(10,NTIME)</td>
<td>REAL</td>
<td>Downward long-wave flux (W/m²)</td>
</tr>
<tr>
<td>USWZ(10,NTIME)</td>
<td>REAL</td>
<td>Upward short-wave flux (W/m²)</td>
</tr>
<tr>
<td>DSWZ(10,NTIME)</td>
<td>REAL</td>
<td>Downward short-wave flux (W/m²)</td>
</tr>
<tr>
<td>BSWZ(10,NTIME)</td>
<td>REAL</td>
<td>Beam short-wave flux (W/m²)</td>
</tr>
</tbody>
</table>
BSTAER

This COMMON block contains the parameters for the temperature dependent background stratospheric aerosol model.

Common Block BSTAER used in:
   AERSOL   BKSTBD   PHFUNC

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IWL(NWLAER)</td>
<td>INTEGER</td>
<td>Key relating the other aerosol wavelength array to WLBST</td>
</tr>
<tr>
<td>WLBST(68)</td>
<td>REAL</td>
<td>Wavelength ($\mu$m)</td>
</tr>
<tr>
<td>STATMP(NSTTMP)</td>
<td>REAL</td>
<td>Temperature (K)</td>
</tr>
<tr>
<td>STMPSC</td>
<td>REAL</td>
<td>Normalized scattering coefficient</td>
</tr>
<tr>
<td>(NSTTMP,68)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STMPAB</td>
<td>REAL</td>
<td>Normalized absorption coefficient</td>
</tr>
<tr>
<td>(NSTTMP,68)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STMPSY</td>
<td>REAL</td>
<td>Asymmetry factor</td>
</tr>
<tr>
<td>(NSTTMP,68)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CDRYDS

This COMMON block contains the user-defined model name.

Common Block CDRYDS used in:
   DIREMS    EMISBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRAC(2,0:NLMAX,6)</td>
<td>REAL</td>
<td>Layer fraction volume</td>
</tr>
<tr>
<td>DEP(0:NLMAX,6)</td>
<td>REAL</td>
<td>Layer depth (m)</td>
</tr>
</tbody>
</table>
CFCBM

This COMMON block contains the cross-sections for the chloro-fluorocarbons.

Common Block CFCBM used in:
   ABSCFC   CFCBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N11</td>
<td>INTEGER</td>
<td>Number of spectral bins for CFC-11</td>
</tr>
<tr>
<td>NV11(2)</td>
<td>INTEGER</td>
<td>Number of spectral points in each bin</td>
</tr>
<tr>
<td>V11(2,2)</td>
<td>REAL</td>
<td>Beginning and ending values for each bin (cm⁻¹)</td>
</tr>
<tr>
<td>CFC11(5,75)</td>
<td>REAL</td>
<td>Cross-sections for CFC-11 (molecules⁻¹ cm²)</td>
</tr>
<tr>
<td>N12</td>
<td>INTEGER</td>
<td>Number of spectral bins for CFC-12</td>
</tr>
<tr>
<td>NV12(2)</td>
<td>INTEGER</td>
<td>Number of spectral points in each bin</td>
</tr>
<tr>
<td>V12(2,2)</td>
<td>REAL</td>
<td>Beginning and ending values for each bin (cm⁻¹)</td>
</tr>
<tr>
<td>CFC12(5,165)</td>
<td>REAL</td>
<td>Cross-sections for CFC-12 (molecules⁻¹ cm²)</td>
</tr>
<tr>
<td>N13</td>
<td>INTEGER</td>
<td>Number of spectral bins for CFC-13</td>
</tr>
<tr>
<td>NV13(3)</td>
<td>INTEGER</td>
<td>Number of spectral points in each bin</td>
</tr>
<tr>
<td>V13(2,3)</td>
<td>REAL</td>
<td>Beginning and ending values for each bin (cm⁻¹)</td>
</tr>
<tr>
<td>CFC13(5,177)</td>
<td>REAL</td>
<td>Cross-sections for CFC-13 (molecules⁻¹ cm²)</td>
</tr>
<tr>
<td>N14</td>
<td>INTEGER</td>
<td>Number of spectral bins for CFC-14</td>
</tr>
<tr>
<td>NV14(1)</td>
<td>INTEGER</td>
<td>Number of spectral points in each bin</td>
</tr>
<tr>
<td>V14(2,1)</td>
<td>REAL</td>
<td>Beginning and ending values for each bin (cm⁻¹)</td>
</tr>
<tr>
<td>CFC14(5,34)</td>
<td>REAL</td>
<td>Cross-sections for CFC-14 (molecules⁻¹ cm²)</td>
</tr>
</tbody>
</table>
CFCBM (continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N21</td>
<td>INTEGER</td>
<td>Number of spectral bins for CFC-21</td>
</tr>
<tr>
<td>NV21(3)</td>
<td>INTEGER</td>
<td>Number of spectral points in each bin</td>
</tr>
<tr>
<td>V21(2,3)</td>
<td>REAL</td>
<td>Beginning and ending values for each bin (cm(^{-1}))</td>
</tr>
<tr>
<td>CFC21(5,172)</td>
<td>REAL</td>
<td>Cross-sections for CFC-21 (molecules(^{-1}) cm(^2))</td>
</tr>
<tr>
<td>N22</td>
<td>INTEGER</td>
<td>Number of spectral bins for CFC-22</td>
</tr>
<tr>
<td>NV22(3)</td>
<td>INTEGER</td>
<td>Number of spectral points in each bin</td>
</tr>
<tr>
<td>V22(2,3)</td>
<td>REAL</td>
<td>Beginning and ending values for each bin (cm(^{-1}))</td>
</tr>
<tr>
<td>CFC22(5,172)</td>
<td>REAL</td>
<td>Cross-sections for CFC-22 (molecules(^{-1}) cm(^2))</td>
</tr>
<tr>
<td>N113</td>
<td>INTEGER</td>
<td>Number of spectral bins for CFC-113</td>
</tr>
<tr>
<td>NV113(2)</td>
<td>INTEGER</td>
<td>Number of spectral points in each bin</td>
</tr>
<tr>
<td>V113(2,2)</td>
<td>REAL</td>
<td>Beginning and ending values for each bin (cm(^{-1}))</td>
</tr>
<tr>
<td>CFC113(5,440)</td>
<td>REAL</td>
<td>Cross-sections for CFC-113 (molecules(^{-1}) cm(^2))</td>
</tr>
<tr>
<td>N114</td>
<td>INTEGER</td>
<td>Number of spectral bins for CFC-114</td>
</tr>
<tr>
<td>NV114(4)</td>
<td>INTEGER</td>
<td>Number of spectral points in each bin</td>
</tr>
<tr>
<td>V114(2,4)</td>
<td>REAL</td>
<td>Beginning and ending values for each bin (cm(^{-1}))</td>
</tr>
<tr>
<td>CFC114(5,358)</td>
<td>REAL</td>
<td>Cross-sections for CFC-114 (molecules(^{-1}) cm(^2))</td>
</tr>
<tr>
<td>N115</td>
<td>INTEGER</td>
<td>Number of spectral bins for CFC-115</td>
</tr>
<tr>
<td>NV115(3)</td>
<td>INTEGER</td>
<td>Number of spectral points in each bin</td>
</tr>
<tr>
<td>V115(2,3)</td>
<td>REAL</td>
<td>Beginning and ending values for each bin (cm(^{-1}))</td>
</tr>
<tr>
<td>CFC115(5,186)</td>
<td>REAL</td>
<td>Cross-sections for CFC-115 (molecules(^{-1}) cm(^2))</td>
</tr>
</tbody>
</table>
CGWTS

This COMMON block contains the summing weights for the Curtis-Godson approximation.

Common Block CGWTS used in:
   BNDPAR    PTHTAU

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGWT1(ISMX, MLLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Curtis-Godson summing weight for S1</td>
</tr>
<tr>
<td>CGWT2(ISMX, MLLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Curtis-Godson summing weight for S2</td>
</tr>
<tr>
<td>CGWT3(ISMX, MLLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Curtis-Godson summing weight for S3</td>
</tr>
<tr>
<td>CGWT4(ISMX, MLLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Curtis-Godson summing weight for S6</td>
</tr>
</tbody>
</table>
CHRCNM

This COMMON block contains the miscellaneous CHARACTER strings used in output files.

Common Block CHRCNM used in:
  ATMPRN  BRBNDR  CHRCBD  EQUABS  PUTCLD  SUMFIL
  USRBCK  MENU    PLTDRV

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAERO(19)</td>
<td>CHARACTER*50</td>
<td>Aerosol titles</td>
</tr>
<tr>
<td>TITAER(19)</td>
<td>CHARACTER*10</td>
<td>Aerosol abbreviated titles</td>
</tr>
<tr>
<td>TTYPE(24)</td>
<td>CHARACTER*50</td>
<td>Model atmosphere titles</td>
</tr>
<tr>
<td>THAZE(9,2)</td>
<td>CHARACTER*50</td>
<td>Haze profile titles</td>
</tr>
<tr>
<td>TUPPER(2)</td>
<td>CHARACTER*50</td>
<td>Upper atmosphere titles</td>
</tr>
<tr>
<td>TITBKD(-4:118)</td>
<td>CHARACTER*10</td>
<td>Abbreviated background titles</td>
</tr>
<tr>
<td>RNTYPE(5)</td>
<td>CHARACTER*40</td>
<td>Rain model titles</td>
</tr>
<tr>
<td>CLDRNM(22)</td>
<td>CHARACTER*60</td>
<td>Cloud/fog/rain titles</td>
</tr>
<tr>
<td>CLDABR(22)</td>
<td>CHARACTER*8</td>
<td>Abbreviated cloud titles</td>
</tr>
<tr>
<td>SNTYPE(6)</td>
<td>CHARACTER*26</td>
<td>Snow model titles</td>
</tr>
<tr>
<td>TITBKG(-4:118)</td>
<td>CHARACTER*60</td>
<td>Background titles</td>
</tr>
</tbody>
</table>
CHRPRM

This COMMON block contains the miscellaneous CHARACTER strings used in the plotting package.

Common Block CHRPRM used in:
   PLTBD      PLTDRV

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLABEL(5)</td>
<td>CHARACTER*50</td>
<td>Plot labels</td>
</tr>
<tr>
<td>XLAB</td>
<td>CHARACTER*42</td>
<td>X-axis label</td>
</tr>
<tr>
<td>MOLNAM(NSMX)</td>
<td>CHARACTER*18</td>
<td>Molecular name</td>
</tr>
</tbody>
</table>
CLDPAR

This COMMON block contains the parameters for determining the impact of clouds on the broad band heat fluxes.

Common Block CLDPAR used in:
   BRBNBD   CLDLYR   FLUXLW

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLC</td>
<td>REAL</td>
<td>Low etage cloud optical depth</td>
</tr>
<tr>
<td>GLC</td>
<td>REAL</td>
<td>Low etage cloud asymmetry factor</td>
</tr>
<tr>
<td>EL</td>
<td>REAL</td>
<td>Low etage cloud emissivity</td>
</tr>
<tr>
<td>TMC</td>
<td>REAL</td>
<td>Middle etage cloud optical depth</td>
</tr>
<tr>
<td>GMC</td>
<td>REAL</td>
<td>Middle etage cloud asymmetry factor</td>
</tr>
<tr>
<td>EM</td>
<td>REAL</td>
<td>Middle etage cloud emissivity</td>
</tr>
<tr>
<td>THC</td>
<td>REAL</td>
<td>High etage cloud optical depth</td>
</tr>
<tr>
<td>GHC</td>
<td>REAL</td>
<td>High etage cloud asymmetry factor</td>
</tr>
<tr>
<td>EH</td>
<td>REAL</td>
<td>High etage cloud emissivity</td>
</tr>
</tbody>
</table>
CLDRN

This COMMON block contains the parameters for altitude dependent cloud/fog/rain/snow conditions.

Common Block CLDRN used in:
- CLDRBD
- ENDPNT
- EQUIABS
- GETCLD
- HYDROM
- PUTCLD
- RAINSP
- TANGPT
- USRCLD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZCLD(21)</td>
<td>REAL</td>
<td>Altitude (km)</td>
</tr>
<tr>
<td>CLDEQ(21,15)</td>
<td>REAL</td>
<td>Liquid water content (gm/m³)</td>
</tr>
<tr>
<td>XLWC(15)</td>
<td>REAL</td>
<td>Conversion from liquid water content to extinction at 0.55 μm (km⁻¹/(gm/m³))</td>
</tr>
<tr>
<td>RNRT(21,15)</td>
<td>REAL</td>
<td>Rain rate (mm/hr)</td>
</tr>
<tr>
<td>NCLD(5)</td>
<td>INTEGER</td>
<td>Cloud index for a given rain model</td>
</tr>
<tr>
<td>NZCLD</td>
<td>INTEGER</td>
<td>Number of altitude points in profile</td>
</tr>
<tr>
<td>NRNTYP(5)</td>
<td>INTEGER</td>
<td>Rain index</td>
</tr>
<tr>
<td>NZUCLD</td>
<td>INTEGER</td>
<td>Number of user-defined altitudes</td>
</tr>
<tr>
<td>ZUCLD(25)</td>
<td>REAL</td>
<td>User-defined altitude (km)</td>
</tr>
<tr>
<td>CLDEQU(25)</td>
<td>REAL</td>
<td>User-defined liquid water content (gm/m³)</td>
</tr>
<tr>
<td>XLWCU</td>
<td>REAL</td>
<td>Conversion from liquid water content to extinction at 0.55 μm for user-defined cloud (km⁻¹/(gm/m³))</td>
</tr>
<tr>
<td>CLDIDCU(25)</td>
<td>REAL</td>
<td>User defined ice content (gm/m³)</td>
</tr>
<tr>
<td>XICEU</td>
<td>REAL</td>
<td>Conversion from ice content to extinction at 0.55 μm for user-defined cloud (km⁻¹/(gm/m³))</td>
</tr>
<tr>
<td>RNRTU(25)</td>
<td>REAL</td>
<td>User-defined rain rate (mm/hr)</td>
</tr>
<tr>
<td>NRNTYU</td>
<td>INTEGER</td>
<td>User-defined rain index</td>
</tr>
<tr>
<td>SNRTU(25)</td>
<td>REAL</td>
<td>User-defined snow rate (mm/hr)</td>
</tr>
<tr>
<td>NSNTYU</td>
<td>INTEGER</td>
<td>User-defined snow index</td>
</tr>
<tr>
<td>CLDBS(16)</td>
<td>REAL</td>
<td>Cloud base altitude (km)</td>
</tr>
<tr>
<td>CLDTP(16)</td>
<td>REAL</td>
<td>Cloud top altitude (km)</td>
</tr>
<tr>
<td>NAERCL(16)</td>
<td>INTEGER</td>
<td>Aerosol index for cloud model</td>
</tr>
</tbody>
</table>
CLDUSR

This COMMON block contains the parameters for a user-defined cloud/rain/snow model.

Common Block CLDUSR used in:

- BNDPAR
- HYDROM
- PHYDRO
- USRCLD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWLCLU</td>
<td>INTEGER</td>
<td>Number of spectral points</td>
</tr>
<tr>
<td>WLCLU(100)</td>
<td>REAL</td>
<td>Wavelength (µm)</td>
</tr>
<tr>
<td>SLWCU(100)</td>
<td>REAL</td>
<td>Normalized scatter coefficient for water</td>
</tr>
<tr>
<td>ALWCU(100)</td>
<td>REAL</td>
<td>Normalized absorption coefficient for water</td>
</tr>
<tr>
<td>GLWCU(100)</td>
<td>REAL</td>
<td>Asymmetry factor for water</td>
</tr>
<tr>
<td>SICEU(100)</td>
<td>REAL</td>
<td>Normalized scatter coefficient for ice</td>
</tr>
<tr>
<td>AICEU(100)</td>
<td>REAL</td>
<td>Normalized absorption coefficient for water</td>
</tr>
<tr>
<td>GICEU(100)</td>
<td>REAL</td>
<td>Asymmetry factor for ice</td>
</tr>
</tbody>
</table>
CLIMAT

This COMMON block contains the layer indices for the broad band heat flux calculations.

Common Block CLIMAT used in:
   FLUXLW   OPATH   PRETEM   SRAT

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IALAY(10)</td>
<td>INTEGER</td>
<td>Altitude index for each layer</td>
</tr>
</tbody>
</table>
**CO2PAR**

This COMMON block contains the LOWTRAN band parameters for carbon dioxide.

Common Block CO2PAR used in:
- LOWTRN
- UMIXBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPCO2(1219)</td>
<td>REAL</td>
<td>LOWTRAN band model parameters for carbon dioxide</td>
</tr>
</tbody>
</table>
CONSTM

This COMMON block contains the basic constants used throughout the program.

Common Block CONSTM used in:

<table>
<thead>
<tr>
<th>ABSMOL</th>
<th>AIRTMP</th>
<th>AMOLSC</th>
<th>ASPECT</th>
<th>ATMPRN</th>
<th>BAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCKGND</td>
<td>BCKPRN</td>
<td>BDRF</td>
<td>BETA</td>
<td>BETAU</td>
<td>BMOD</td>
</tr>
<tr>
<td>BNDPAR</td>
<td>BRBNDR</td>
<td>CNSTNT</td>
<td>COAT</td>
<td>COMFNC</td>
<td>COUPLE</td>
</tr>
<tr>
<td>CSPHFN</td>
<td>DBINIT</td>
<td>DESAER</td>
<td>DFLT2</td>
<td>DFLT8</td>
<td>DIREMS</td>
</tr>
<tr>
<td>DNDR</td>
<td>DPLDT</td>
<td>ECLGAL</td>
<td>ENDPT</td>
<td>EPHEML</td>
<td>EPHEMS</td>
</tr>
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<td>EQUABS</td>
<td>EQUECL</td>
<td>ESFIT</td>
<td>EXGALS</td>
<td>FILTER</td>
</tr>
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<td>FRESNL</td>
<td>GALRAD</td>
<td>GEOM</td>
<td>GETSLR</td>
<td>HOREQU</td>
<td>HORIZN</td>
</tr>
<tr>
<td>HTBLNC</td>
<td>INICPL</td>
<td>INIGEO</td>
<td>INITL</td>
<td>LRYINT</td>
<td>MARINE</td>
</tr>
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<td>MIE</td>
<td>MIEPHS</td>
<td>MLSCAT</td>
<td>MODBCK</td>
<td>PHFUNC</td>
<td>PHYDRO</td>
</tr>
<tr>
<td>PLANCK</td>
<td>PLANET</td>
<td>PRCALC</td>
<td>PRETEM</td>
<td>PROFAC</td>
<td>PTHOSB</td>
</tr>
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<td>PTHTAU</td>
<td>RADTRX</td>
<td>RADTRY</td>
<td>RAINEX</td>
<td>REFEST</td>
<td>RSHINE</td>
</tr>
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<td>SATUR</td>
<td>SCINTL</td>
<td>SCNRIIO</td>
<td>SETALT</td>
<td>SETUP</td>
<td>SHADOW</td>
</tr>
<tr>
<td>SHNGEO</td>
<td>SKYNOI</td>
<td>SLPOS</td>
<td>SLUNAR</td>
<td>SNOWEX</td>
<td>SPCLYR</td>
</tr>
<tr>
<td>SPTRIG</td>
<td>SRCGEO</td>
<td>SRCIRR</td>
<td>STARAD</td>
<td>STGEO M</td>
<td>STRCN2</td>
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<tr>
<td>SUPK</td>
<td>TERMPR</td>
<td>UDLAY</td>
<td>USRDEF</td>
<td>XTERP</td>
<td>ZLAT</td>
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<td>ZODICL</td>
<td>BBTEMP</td>
<td>INVPLK</td>
<td>FPTEST</td>
<td>ATMOUT</td>
<td>VISUAL</td>
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</table>

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPI</td>
<td>DOUBLE PRECISION</td>
<td>3.1415926358979</td>
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<tr>
<td>DRAD</td>
<td>DOUBLE PRECISION</td>
<td>Pi/180 for conversion of degrees to radians</td>
</tr>
<tr>
<td>DE</td>
<td>DOUBLE PRECISION</td>
<td>2.71828182845904</td>
</tr>
<tr>
<td>DEPSMN</td>
<td>DOUBLE PRECISION</td>
<td>Smallest normalized positive number</td>
</tr>
<tr>
<td>DEPSMX</td>
<td>DOUBLE PRECISION</td>
<td>Largest normalized positive number</td>
</tr>
<tr>
<td>DEPSDF(2)</td>
<td>DOUBLE PRECISION</td>
<td>Smallest value that can be significantly added (1) or subtracted (2) from unity</td>
</tr>
<tr>
<td>DEPSDN</td>
<td>DOUBLE PRECISION</td>
<td>Smallest denormalized positive number</td>
</tr>
<tr>
<td>PI</td>
<td>REAL</td>
<td>3.14159</td>
</tr>
<tr>
<td>RAD</td>
<td>REAL</td>
<td>Pi/180 for conversion of degrees to radians</td>
</tr>
<tr>
<td>Variable</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>---------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>E</td>
<td>REAL</td>
<td>2.71828</td>
</tr>
<tr>
<td>EPSMIN</td>
<td>REAL</td>
<td>Smallest normalized positive number</td>
</tr>
<tr>
<td>EPSMAX</td>
<td>REAL</td>
<td>Largest normalized positive number</td>
</tr>
<tr>
<td>EPSDIF(2)</td>
<td>REAL</td>
<td>Smallest value that can be significantly added (1) or subtracted (2) from unity</td>
</tr>
<tr>
<td>EPSDNM</td>
<td>REAL</td>
<td>Smallest denormalized positive number</td>
</tr>
<tr>
<td>IRADIX</td>
<td>INTEGER</td>
<td>Radix; basic unit of calculation</td>
</tr>
<tr>
<td>ITR</td>
<td>INTEGER</td>
<td>Number of bits in REAL significand</td>
</tr>
<tr>
<td>ITD</td>
<td>INTEGER</td>
<td>Number of bits in DOUBLE PRECISION significand</td>
</tr>
<tr>
<td>IRND</td>
<td>INTEGER</td>
<td>Addition rounding switch</td>
</tr>
<tr>
<td>NGRD</td>
<td>INTEGER</td>
<td>Number of guard digits</td>
</tr>
<tr>
<td>MACHEP</td>
<td>INTEGER</td>
<td>Smallest exponent for 1+e (REAL)</td>
</tr>
<tr>
<td>NEGEP</td>
<td>INTEGER</td>
<td>Smallest exponent for 1-e (REAL)</td>
</tr>
<tr>
<td>MACHED</td>
<td>INTEGER</td>
<td>Smallest exponent for 1+e (DOUBLE PRECISION)</td>
</tr>
<tr>
<td>NEGEPD</td>
<td>INTEGER</td>
<td>Smallest exponent for 1-e (DOUBLE PRECISION)</td>
</tr>
<tr>
<td>MINEXP</td>
<td>INTEGER</td>
<td>Minimum REAL exponent</td>
</tr>
<tr>
<td>MAXEXP</td>
<td>INTEGER</td>
<td>Maximum REAL exponent</td>
</tr>
<tr>
<td>MINEXD</td>
<td>INTEGER</td>
<td>Minimum DOUBLE PRECISION exponent</td>
</tr>
<tr>
<td>MAXEXD</td>
<td>INTEGER</td>
<td>Maximum DOUBLE PRECISION exponent</td>
</tr>
<tr>
<td>IEXPR</td>
<td>INTEGER</td>
<td>Number of bits in REAL exponent</td>
</tr>
<tr>
<td>IEXPD</td>
<td>INTEGER</td>
<td>Number of bits in DOUBLE PRECISION exponent</td>
</tr>
<tr>
<td>IUNDFL</td>
<td>INTEGER</td>
<td>Gradual/abrupt underflow switch</td>
</tr>
<tr>
<td>ICMLMT</td>
<td>INTEGER</td>
<td>One's/two's/signed complement switch</td>
</tr>
<tr>
<td>IEND</td>
<td>INTEGER</td>
<td>Big/little-endian switch</td>
</tr>
<tr>
<td>IREG</td>
<td>INTEGER</td>
<td>Register vs. storage calculation switch</td>
</tr>
</tbody>
</table>
CONTNS

This COMMON block contains the parameters for the self- and foreign-broadened water vapor continuum.

Common Block CONTNS used in:
   H2OBD    H2OCNT

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VS1</td>
<td>REAL</td>
<td>Initial wavenumber (cm(^{-1}))</td>
</tr>
<tr>
<td>VS2</td>
<td>REAL</td>
<td>Final wavenumber (cm(^{-1}))</td>
</tr>
<tr>
<td>DVS</td>
<td>REAL</td>
<td>Wavenumber increment (cm(^{-1}))</td>
</tr>
<tr>
<td>NPTSC</td>
<td>INTEGER</td>
<td>Number of spectral points</td>
</tr>
<tr>
<td>TEMP(2)</td>
<td>REAL</td>
<td>Temperature (K)</td>
</tr>
<tr>
<td>SBAC(-1:2001,2)</td>
<td>REAL</td>
<td>Temperature dependent self-broadened continuum (amagat(^{-1}) cm(^{-1}))</td>
</tr>
<tr>
<td>FBAC(-1:2001)</td>
<td>REAL</td>
<td>Foreign broadened continuum (amagat(^{-1}) cm(^{-1}))</td>
</tr>
</tbody>
</table>
CRASYM

This COMMON block contains the asymmetry factors for the standard, sub-visual, and Heymsfield cirrus cloud models.

Common Block CRASYM used in:
CIRRBD   PHYDRO

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIRASY</td>
<td>REAL</td>
<td>Asymmetry factors</td>
</tr>
<tr>
<td>(NWCLLD,4,3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CURGDA

This COMMON block contains the Curtis-Godson summing variables for correlation calculations.

Common Block CURGDA used in:
PRCALC PTHTAU RSHINE

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1S(ISMX,MLMX2)</td>
<td>REAL</td>
<td>Intermediate values of the summing variable for Lorentz half-width times the line density</td>
</tr>
<tr>
<td>S2S(ISMX,MLMX2)</td>
<td>REAL</td>
<td>Intermediate values of the summing variable for Doppler half-width times the line density</td>
</tr>
</tbody>
</table>
CURGDB

This COMMON block contains the Curtis-Godson summing variables for correlation calculations.

Common Block CURGDB used in:
PRCALC PTHTAU RSHINE

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S3S(ISMX,MLMX2)</td>
<td>REAL</td>
<td>Intermediate values of the summing variable for line density (cm)</td>
</tr>
<tr>
<td>S4S(ISMX,MLMX2)</td>
<td>REAL</td>
<td>Intermediate values of the summing variable for the continuum optical depth</td>
</tr>
</tbody>
</table>
**CURGDC**

This COMMON block contains the Curtis-Godson summing variables for correlation calculations.

Common Block CURGDC used in:  
PRCALC   PTHOSB   PTHTAU   RSHINE

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S5S(ISMX,MLMX2)</td>
<td>REAL</td>
<td>Intermediate values of the summing variable for scattering optical depth</td>
</tr>
<tr>
<td>S6S(ISMX,MLMX2)</td>
<td>REAL</td>
<td>Intermediate values of the summing variable for the square of the Lorentz half-width</td>
</tr>
</tbody>
</table>
DESDAT

This COMMON block contains the parameters for the desert aerosol model.

Common Block DESDAT used in:
   DESAER    DSRTBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESEX(NWLAER,4)</td>
<td>REAL</td>
<td>Normalized extinction coefficient equal to unity at 0.55 μm</td>
</tr>
<tr>
<td>DESAB(NWLAER,4)</td>
<td>REAL</td>
<td>Normalized absorption coefficient</td>
</tr>
<tr>
<td>DESG(NWLAER,4)</td>
<td>REAL</td>
<td>Asymmetry factor</td>
</tr>
</tbody>
</table>
DEVCNM

This COMMON block contains the CHARACTER strings for the binary data bases used by the code.

Common Block DEVCNM used in:

<table>
<thead>
<tr>
<th>DBINIT</th>
<th>DEVCBD</th>
<th>FILRT</th>
<th>RDGBL</th>
<th>RDSCN</th>
<th>SUMFIL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFBMD(MOLMAX)</td>
<td>CHARACTER*60</td>
<td>File names of the direct access binary data base files</td>
</tr>
<tr>
<td>SUFFIX(18)</td>
<td>CHARACTER*10</td>
<td>Suffixes for all input and output files</td>
</tr>
<tr>
<td>NFGBL</td>
<td>CHARACTER*60</td>
<td>File name for global climatology data base</td>
</tr>
<tr>
<td>NFSCN</td>
<td>CHARACTER*60</td>
<td>File name for terrain scene and altitude data base</td>
</tr>
<tr>
<td>NFVFT</td>
<td>CHARACTER*60</td>
<td>File name for MODTRAN band parameter data base</td>
</tr>
<tr>
<td>DIRPTH</td>
<td>CHARACTER*60</td>
<td>Data base directory path</td>
</tr>
</tbody>
</table>

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DEVICE

This COMMON block contains the file unit numbers used by the code.

Common Block DEVICE used in:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSMOL</td>
<td>ATMPRN</td>
<td>BCKPRN</td>
</tr>
<tr>
<td>DEFALT</td>
<td>DEVCBD</td>
<td>DFLT8</td>
</tr>
<tr>
<td>GETATM</td>
<td>GETBCK</td>
<td>GETCLD</td>
</tr>
<tr>
<td>MIEINP</td>
<td>MOSART</td>
<td>PRCALC</td>
</tr>
<tr>
<td>RDFLTR</td>
<td>RDGBK</td>
<td>RDSCN</td>
</tr>
<tr>
<td>ASCBIN</td>
<td>BBTEMP</td>
<td>CRFILE</td>
</tr>
<tr>
<td>ATMINT</td>
<td>ATMOUT</td>
<td>BCKINT</td>
</tr>
<tr>
<td>MRFLTR</td>
<td>VISUAL</td>
<td></td>
</tr>
<tr>
<td>IFINP</td>
<td>INTEGER</td>
<td>Input file number</td>
</tr>
<tr>
<td>IFOUT</td>
<td>INTEGER</td>
<td>Output file number</td>
</tr>
<tr>
<td>IFATM</td>
<td>INTEGER</td>
<td>Atmospheric binary file number</td>
</tr>
<tr>
<td>IFBCK</td>
<td>INTEGER</td>
<td>Background binary file number</td>
</tr>
<tr>
<td>IFPLM</td>
<td>INTEGER</td>
<td>Plume binary file number</td>
</tr>
<tr>
<td>IFMSC</td>
<td>INTEGER</td>
<td>Multiple scatter binary file number</td>
</tr>
<tr>
<td>IFHTR</td>
<td>INTEGER</td>
<td>Heat transfer binary file number</td>
</tr>
<tr>
<td>IFTRN</td>
<td>INTEGER</td>
<td>Transmittance binary file number</td>
</tr>
<tr>
<td>IFUAT</td>
<td>INTEGER</td>
<td>User-defined atmosphere file number</td>
</tr>
<tr>
<td>IFUBK</td>
<td>INTEGER</td>
<td>User-defined background file number</td>
</tr>
<tr>
<td>IFUCL</td>
<td>INTEGER</td>
<td>User-defined cloud file number</td>
</tr>
<tr>
<td>IFUAR</td>
<td>INTEGER</td>
<td>User-defined aerosol file number</td>
</tr>
<tr>
<td>IFASC</td>
<td>INTEGER</td>
<td>ASCII conversion file number</td>
</tr>
<tr>
<td>IFTBL</td>
<td>INTEGER</td>
<td>Tabular file number</td>
</tr>
<tr>
<td>IFFLT</td>
<td>INTEGER</td>
<td>Filter response file number</td>
</tr>
<tr>
<td>IFTP7</td>
<td>INTEGER</td>
<td>LOWTRAN TAPE7 file number</td>
</tr>
<tr>
<td>IFTP8</td>
<td>INTEGER</td>
<td>LOWTRAN TAPE8 file number</td>
</tr>
<tr>
<td>IFDIS</td>
<td>INTEGER</td>
<td>DIS in-band file number</td>
</tr>
<tr>
<td>IFBMD(MOLMAX)</td>
<td>INTEGER</td>
<td>Molecular data base file numbers</td>
</tr>
<tr>
<td>IFVFT</td>
<td>INTEGER</td>
<td>MODTRAN band parameter file number</td>
</tr>
<tr>
<td>IFGBL</td>
<td>INTEGER</td>
<td>Global data base file number</td>
</tr>
<tr>
<td>IFSCN</td>
<td>INTEGER</td>
<td>Scene data base file number</td>
</tr>
<tr>
<td>IFSCR</td>
<td>INTEGER</td>
<td>Scratch file number</td>
</tr>
<tr>
<td>IFSCE</td>
<td>INTEGER</td>
<td>Geometry scratch file number</td>
</tr>
<tr>
<td>Variable</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------</td>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td>IRECL(MOLMAX)</td>
<td>INTEGER</td>
<td>Molecular data base record lengths</td>
</tr>
<tr>
<td>IRECLU</td>
<td>INTEGER</td>
<td>MODTRAN band parameter data base record length</td>
</tr>
<tr>
<td>IRECLG</td>
<td>INTEGER</td>
<td>Global data base record length</td>
</tr>
<tr>
<td>IRECLS</td>
<td>INTEGER</td>
<td>Scene data base record length</td>
</tr>
<tr>
<td>NVRMAX(MOLMAX)</td>
<td>INTEGER</td>
<td>Number of records for molecular data bases</td>
</tr>
<tr>
<td>NVRMXU</td>
<td>INTEGER</td>
<td>Number of records for MODTRAN band parameter data base</td>
</tr>
<tr>
<td>NVRMXG</td>
<td>INTEGER</td>
<td>Number of records for global data base</td>
</tr>
<tr>
<td>NVRMXS</td>
<td>INTEGER</td>
<td>Number of records for scene data base</td>
</tr>
<tr>
<td>FLBMD(MOLMAX)</td>
<td>LOGICAL</td>
<td>Flag for existence of separate molecular data base file</td>
</tr>
</tbody>
</table>
**EXTMOL**

This COMMON block contains the trace gas altitude profiles.

Common Block EXTMOL used in:
- EQABS
- EXMLBD
- USRDEF

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMOL(NL,38)</td>
<td>REAL</td>
<td>Trace gas concentration profiles (ppmv)</td>
</tr>
</tbody>
</table>
FLAGS

This COMMON block contains various flags to control certain calculations.

**Common Block FLAGS used in:**
- ATMPRN
- BCKCHK
- BCKPRN
- BINFL
- CALCUL
- EPHEMS
- EQABS
- HAZE
- INITL
- ISRAEL
- MOSART
- PRCALC
- PUTSLR
- RSHINE
- SCNRIO
- SETFLG
- SRCIRR
- SUMFL
- TERMPR
- BBTEMP
- MRFLTR
- VISUAL

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLSLR</td>
<td>LOGICAL</td>
<td>Solar calculation flag</td>
</tr>
<tr>
<td>FLLNR</td>
<td>LOGICAL</td>
<td>Lunar calculation flag</td>
</tr>
<tr>
<td>FLEPH</td>
<td>LOGICAL</td>
<td>Ephemeris calculation flag</td>
</tr>
<tr>
<td>FLSMP</td>
<td>LOGICAL</td>
<td>Solar simple calculation flag</td>
</tr>
<tr>
<td>FLSML</td>
<td>LOGICAL</td>
<td>Lunar simple calculation flag</td>
</tr>
<tr>
<td>FLVSA</td>
<td>LOGICAL</td>
<td>Vertical structure algorithm calculation flag</td>
</tr>
<tr>
<td>FLATM</td>
<td>LOGICAL</td>
<td>Atmospheric file existence flag</td>
</tr>
<tr>
<td>FLBCCK</td>
<td>LOGICAL</td>
<td>Background file existence flag</td>
</tr>
<tr>
<td>FLFBA</td>
<td>LOGICAL</td>
<td>Fore/background flag</td>
</tr>
<tr>
<td>FLSRC(NGMAX)</td>
<td>LOGICAL</td>
<td>Source geometry flag</td>
</tr>
<tr>
<td>FLCNT(NGMAX)</td>
<td>LOGICAL</td>
<td>Combined (contrast) geometry flag</td>
</tr>
<tr>
<td>FLASR(NGMAX)</td>
<td>LOGICAL</td>
<td>At-source geometry flag</td>
</tr>
<tr>
<td>FLHOR(NGMAX)</td>
<td>LOGICAL</td>
<td>Horizontal path geometry flag</td>
</tr>
<tr>
<td>FLIMB(NGMAX)</td>
<td>LOGICAL</td>
<td>Earthlimb geometry flag</td>
</tr>
<tr>
<td>FLMSC</td>
<td>LOGICAL</td>
<td>Multiple scattering flag</td>
</tr>
</tbody>
</table>
**FLTRDT**

This COMMON block contains the filter response parameters.

Common Block FLTRDT used in:

<table>
<thead>
<tr>
<th>FILTER</th>
<th>MOSART</th>
<th>RDLFLTR</th>
<th>BBTEMP</th>
<th>MRFLTR</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFLTR</td>
<td>INTEGER</td>
<td>Number of spectral points in filter response function</td>
</tr>
<tr>
<td>WLF(1200)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>FLTR(1200)</td>
<td>REAL</td>
<td>Spectral filter response function</td>
</tr>
</tbody>
</table>
FLXTAB

This COMMON block contains various parameters for the broad band heat flux taken from Staley and Jurica.

Common Block FLXTAB used in:
   BRBNBD    TRANLW

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTAB(21,4)</td>
<td>REAL</td>
<td>Unknown parameter for water vapor</td>
</tr>
<tr>
<td>VTAB(23,4)</td>
<td>REAL</td>
<td>Unknown parameter for carbon dioxide</td>
</tr>
<tr>
<td>WTAB(16,4)</td>
<td>REAL</td>
<td>Unknown parameter for ozone</td>
</tr>
<tr>
<td>OPR(23,3)</td>
<td>REAL</td>
<td>Unknown parameter</td>
</tr>
<tr>
<td>TR(4)</td>
<td>REAL</td>
<td>Unknown parameter</td>
</tr>
<tr>
<td>IR(3)</td>
<td>INTEGER</td>
<td>Unknown parameter</td>
</tr>
</tbody>
</table>
GAUSSL

This COMMON block contains the Gauss-Legendre coefficients.

Common Block GAUSSL used in:
GETGLC   GLCFBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XMU2(1)</td>
<td>DOUBLE PRECISION</td>
<td>2-point Gauss-Legendre abscissa</td>
</tr>
<tr>
<td>WT2(1)</td>
<td>DOUBLE PRECISION</td>
<td>2-point Gauss-Legendre weights</td>
</tr>
<tr>
<td>XMU3(2)</td>
<td>DOUBLE PRECISION</td>
<td>3-point Gauss-Legendre abscissa</td>
</tr>
<tr>
<td>WT3(2)</td>
<td>DOUBLE PRECISION</td>
<td>3-point Gauss-Legendre weights</td>
</tr>
<tr>
<td>XMU4(2)</td>
<td>DOUBLE PRECISION</td>
<td>4-point Gauss-Legendre abscissa</td>
</tr>
<tr>
<td>WT4(2)</td>
<td>DOUBLE PRECISION</td>
<td>4-point Gauss-Legendre weights</td>
</tr>
<tr>
<td>XMU5(3)</td>
<td>DOUBLE PRECISION</td>
<td>5-point Gauss-Legendre abscissa</td>
</tr>
<tr>
<td>WT5(3)</td>
<td>DOUBLE PRECISION</td>
<td>5-point Gauss-Legendre weights</td>
</tr>
<tr>
<td>XMU6(3)</td>
<td>DOUBLE PRECISION</td>
<td>6-point Gauss-Legendre abscissa</td>
</tr>
<tr>
<td>WT6(3)</td>
<td>DOUBLE PRECISION</td>
<td>6-point Gauss-Legendre weights</td>
</tr>
<tr>
<td>XMU7(4)</td>
<td>DOUBLE PRECISION</td>
<td>7-point Gauss-Legendre abscissa</td>
</tr>
<tr>
<td>WT7(4)</td>
<td>DOUBLE PRECISION</td>
<td>7-point Gauss-Legendre weights</td>
</tr>
<tr>
<td>XMU8(4)</td>
<td>DOUBLE PRECISION</td>
<td>8-point Gauss-Legendre abscissa</td>
</tr>
<tr>
<td>WT8(4)</td>
<td>DOUBLE PRECISION</td>
<td>8-point Gauss-Legendre weights</td>
</tr>
<tr>
<td>XMU9(5)</td>
<td>DOUBLE PRECISION</td>
<td>9-point Gauss-Legendre abscissa</td>
</tr>
<tr>
<td>WT9(5)</td>
<td>DOUBLE PRECISION</td>
<td>9-point Gauss-Legendre weights</td>
</tr>
<tr>
<td>XMU10(5)</td>
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GAUSSL (continued)

- XMU128(64)  DOUBLE PRECISION  128-point Gauss-Legendre abscissa
- WT128(64)   DOUBLE PRECISION  128-point Gauss-Legendre weights
- XMU512(256) DOUBLE PRECISION  512-point Gauss-Legendre abscissa
- WT512(256)  DOUBLE PRECISION  512-point Gauss-Legendre weights
- NPTS(17)    INTEGER           Number of points in quadrature
- MPTS(17)    INTEGER           Number of points in arrays
H2OPAR

This COMMON block contains the LOWTRAN band parameters of water vapor.

Common Block H2OPAR used in:
CH2OBD  LOWTRN

<table>
<thead>
<tr>
<th>Variable Name</th>
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<th>Description</th>
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<tbody>
<tr>
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<td>LOWTRAN band model parameters for water vapor</td>
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**HEADER**

This COMMON block contains the variables which form the main header of the output binary files.

Common Block HEADER used in:

- ATMPRN  BCKGND  BCKPRN  BNDPAR  BRBNDR  CALCUL
- COUPLE  DEFAIT  DEFBCK  ENDPT  EQABS  EQUABS
- GETASP  GETATM  GETBCK  GETCLD  INICPL  INIGEO
- INITL   KDISTR  MOSART  PRCALC  PRTHDR  PTHOSB
- PUTCLD  PUTHDR  PUTSLR  RSHINE  SCNRIIO  SETBCK
- SRCFLX  SRCIRR  SUMFIL  TANGPT  USRDEF  ZROHDR
- BBTEMP  GETHDR  PUTCLD  PUTSLR  SUMFIL  GETHDR
- TABLEA  TABLEB  TABLEH  VISUAL  PLTDRV  PLTGEN
- RDMSRT  ATMOUT  MRFLTR

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<tr>
<td>MT(MAXLAT, MAXLON)</td>
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<td>MC(ISMX,MAXLAT, MAXLON)</td>
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<td>Description</td>
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<td>Azimuth if other latitude and longitude are defined (deg)</td>
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<td>Description</td>
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<td>Initial wavenumber (cm⁻¹)</td>
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<td>Final wavenumber (cm⁻¹)</td>
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<td>Cirrus thickness (km)</td>
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<td>Inversion altitude (km)</td>
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<td>Local wind speed (m/sec)</td>
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<td>Latitude of observer and source (deg)</td>
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<tr>
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<td>Longitude of observer and source (deg)</td>
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<td>Total/low/mid/high cloud cover (%)</td>
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<td>HPRF(2)</td>
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<td>Initial and final altitudes for profile (km)</td>
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<td>Variable</td>
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<td>Description</td>
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<td>REAL</td>
<td>Observer field of regard (mrad)</td>
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<td>CIREXT</td>
<td>REAL</td>
<td>Cirrus extinction coefficient at 0.55 μm (km⁻¹)</td>
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<td>CIRICE</td>
<td>REAL</td>
<td>Cirrus ice content (gm/m³)</td>
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<td>ULWSRC(NAZMAX, NGMAX)</td>
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<td>Upward long-wave flux at source (W/m²)</td>
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<tr>
<td>DLWSRC(NAZMAX, NGMAX)</td>
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<td>Downward long-wave flux at source (W/m²)</td>
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<td>BSWSRC(NAZMAX, NGMAX)</td>
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<td>Low/mid/high etage cloud top altitude (km)</td>
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HERZBG

This COMMON block contains the parameters for the Herzberg absorption bands of molecular oxygen in the ultraviolet.

Common Block HERZBG used in:
    ABSO2    O2UVBD

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<td>SDOXY(248)</td>
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<td>AOXY(248)</td>
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<td>Pressure correction term</td>
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<td>(1.E-26 cm² torr⁻¹)</td>
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HZDATA

This COMMON block contains the parameters for the model haze profiles.

Common Block HZDATA used in:
   HAZE      HAZEBD

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<td>Sea level meteorological ranges (km)</td>
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<td>ZBNDR(NZBNDR)</td>
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<td>Boundary layer altitudes (km)</td>
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<td>HZBNDR(NZBNDR,5)</td>
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<td>Boundary layer haze extinction coefficients (km(^{-1}))</td>
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<tr>
<td>HZTROP(NZTROP, 2,2)</td>
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<td>Troposphere haze extinction coefficients (km(^{-1})) with seasonal variability for meteorological ranges for 23 and 50 km</td>
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<td>HZSTRA(NZSTRA, 2,4)</td>
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<td>HZUPPR(NZUPR,2,2)</td>
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<td>Upper atmosphere haze extinction coefficients (km(^{-1})) with variations due to volcanic activity (i.e., background and volcanic) and upper atmosphere haze level (i.e., normal and extreme)</td>
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ICEREF

This COMMON block contains the index of refraction of ice.

Common Block ICEREF used in:
ICEBD    INDEXI

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWLICE</td>
<td>INTEGER</td>
<td>Number of spectral points for WLICE</td>
</tr>
<tr>
<td>WLICE(468)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>XMRE(468)</td>
<td>REAL</td>
<td>Real component of the index of refraction</td>
</tr>
<tr>
<td>XMIM(468)</td>
<td>REAL</td>
<td>Imaginary component of the index of refraction</td>
</tr>
<tr>
<td>NWLJ</td>
<td>INTEGER</td>
<td>Number of spectral points for WLJ</td>
</tr>
<tr>
<td>WLJ(62)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>YMRE(62,4)</td>
<td>REAL</td>
<td>Temperature-dependent real component of the index of refraction</td>
</tr>
<tr>
<td>YMIM(62,4)</td>
<td>REAL</td>
<td>Temperature-dependent imaginary component of the index of refraction</td>
</tr>
<tr>
<td>TEMICE(4)</td>
<td>REAL</td>
<td>Temperature (K)</td>
</tr>
</tbody>
</table>
INBKGD

This COMMON block contains the sample user-defined background input file.

Common Block INBKGD used in:
  CRBKGD   INBKBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPBCK(39)</td>
<td>CHARACTER*60</td>
<td>User-defined background records</td>
</tr>
<tr>
<td>INPSCN(80)</td>
<td>CHARACTER*80</td>
<td>User-defined scene records</td>
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</table>
This COMMON block contains the index of refraction of water.

Common Block INDXWR used in:
INDEXW WTRBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLWTR(NWLWTR)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>WTRINR(NWLWTR)</td>
<td>REAL</td>
<td>Real component of the index of refraction</td>
</tr>
<tr>
<td>WTRINI(NWLWTR)</td>
<td>REAL</td>
<td>Imaginary component of the index of refraction</td>
</tr>
<tr>
<td>FRGHZ(NFRQ)</td>
<td>REAL</td>
<td>Frequency (GHz)</td>
</tr>
<tr>
<td>WTDER(NFRQ)</td>
<td>REAL</td>
<td>Real component of the microwave index of refraction</td>
</tr>
<tr>
<td>WTDEI(NFRQ)</td>
<td>REAL</td>
<td>Imaginary component of the microwave index of refraction</td>
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</tbody>
</table>
**INLTR**

This COMMON block contains the sample user-defined filter response input file.

Common Block INLTR used in:
- CRFLTR
- INFLBD
- RDFLTR

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
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<tbody>
<tr>
<td>INPFLT(57)</td>
<td>CHARACTER*56</td>
<td>Filter response records</td>
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</table>
INITIAL

This COMMON block contains the final atmospheric parameter arrays.

Common Block INITIAL used in:

<table>
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<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
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<tbody>
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<td>BMOD</td>
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<td>BNDPAR</td>
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<td>BRBNDR</td>
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<td>COUPLE</td>
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<td>ENDP</td>
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<tr>
<td>EPHEMS</td>
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<tr>
<td>EQUABS</td>
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<td>GEOM</td>
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<tr>
<td>HYDROM</td>
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<td>INICPL</td>
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<td>INIGEO</td>
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<tr>
<td>LOWTRN</td>
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<td>MOSART</td>
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<td>PUTHDR</td>
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<td>RAYPTH</td>
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<td>SCNARIO</td>
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<tr>
<td>SETALT</td>
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<td>SHNGEO</td>
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<td>SRCGEO</td>
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<td>SRCIRR</td>
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<tr>
<td>TANGPT</td>
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</tr>
<tr>
<td>MRFLTR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE</td>
<td>DOUBLE PRECISION</td>
<td>Radius of the earth (km)</td>
</tr>
<tr>
<td>ML</td>
<td>INTEGER</td>
<td>Number of altitudes in final atmospheric profile</td>
</tr>
<tr>
<td>ZL(MLMAX)</td>
<td>REAL</td>
<td>Altitude (km)</td>
</tr>
<tr>
<td>PL(MLMAX,MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Pressure (mb)</td>
</tr>
<tr>
<td>TL(MLMAX,MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Temperature (K)</td>
</tr>
<tr>
<td>W(ISMX,MLMAX,MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Equivalent absorber amounts for each molecular type (amagat)</td>
</tr>
<tr>
<td>IAERO(MLMAX,MAXLAT,MAXLON)</td>
<td>INTEGER</td>
<td>Aerosol model index</td>
</tr>
<tr>
<td>LOBSV(NGMAX)</td>
<td>INTEGER</td>
<td>Position of observer in altitude profile</td>
</tr>
<tr>
<td>LSRCE(NGMAX)</td>
<td>INTEGER</td>
<td>Position of source in altitude profile</td>
</tr>
<tr>
<td>LBKGD</td>
<td>INTEGER</td>
<td>Position of background in altitude profile</td>
</tr>
<tr>
<td>DTDP(MLMAX,MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>$d(\Theta)/d(\Phi)$ calculated from refractive index profile</td>
</tr>
<tr>
<td>XMH(MLMAX,MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Refractive bending constant</td>
</tr>
<tr>
<td>Variable</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>CN2(MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Turbulence structure constant (m^{2/3})</td>
</tr>
<tr>
<td>RHL(MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Relative humidity</td>
</tr>
<tr>
<td>PRTNFN(ISMX, MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Molecular partition functions</td>
</tr>
<tr>
<td>CLDLWC(MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Cloud liquid water content (gm/m^3)</td>
</tr>
<tr>
<td>CLDICE(MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Cloud ice content (gm/m^3)</td>
</tr>
<tr>
<td>RRATE(MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Rain rate (mm/hr)</td>
</tr>
<tr>
<td>SRATE(MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Snow rate (mm/hr)</td>
</tr>
<tr>
<td>NTRPAU(MAXLAT, MAXLON)</td>
<td>INTEGER</td>
<td>Position of tropopause in altitude profile</td>
</tr>
<tr>
<td>NSTPAU(MAXLAT, MAXLON)</td>
<td>INTEGER</td>
<td>Position of stratopause in altitude profile</td>
</tr>
<tr>
<td>ML0</td>
<td>INTEGER</td>
<td>Initial number of altitudes in atmosphere profile, before any tangent points are added</td>
</tr>
<tr>
<td>LMIN(MLMAX)</td>
<td>INTEGER</td>
<td>Pointer to altitude of tangent points</td>
</tr>
<tr>
<td>LSOLAR</td>
<td>INTEGER</td>
<td>Position of sun in altitude profile</td>
</tr>
<tr>
<td>LLUNAR</td>
<td>INTEGER</td>
<td>Position of moon in altitude profile</td>
</tr>
<tr>
<td>CT2(MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Temperature structure constant (m^{-2/3} K^2)</td>
</tr>
<tr>
<td>Function</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>CSM2(MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Molecular scattering structure constant (m$^{2/3}$ km$^{-2}$)</td>
</tr>
<tr>
<td>CSA2(MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Aerosol scattering structure constant (m$^{2/3}$ km$^{-2}$)</td>
</tr>
<tr>
<td>SKYFAC(3,MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Sky noise factor</td>
</tr>
</tbody>
</table>
INPNDX

This COMMON block contains the indices for the sub-sections for the MOSART input file.

Common Block INPNDX used in:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CRINPT</td>
<td>CRUATM</td>
<td>INPTBD</td>
</tr>
<tr>
<td>RDMDTN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPDX(18)</td>
<td>INTEGER</td>
<td>Indices for MOSART input file sub-sections</td>
</tr>
</tbody>
</table>
INPTDT

This COMMON block contains the sample input file.

Common Block INPTDT used in:
INITL    INPTBD    CRINPT    CRUATM    INPTBD    RDMDTN

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPSTR(202)</td>
<td>CHARACTER*50</td>
<td>Input file records</td>
</tr>
<tr>
<td>TITL</td>
<td>CHARACTER*80</td>
<td>Input file title</td>
</tr>
<tr>
<td>GEOMST(3)</td>
<td>CHARACTER*80</td>
<td>Sample geometry records</td>
</tr>
<tr>
<td>ANTTEST(8)</td>
<td>CHARACTER*80</td>
<td>Antecedent parameter records</td>
</tr>
<tr>
<td>SUBTIT(17)</td>
<td>CHARACTER*50</td>
<td>Subsection headings</td>
</tr>
<tr>
<td>ATMPAR(19)</td>
<td>CHARACTER*80</td>
<td>User-defined atmosphere records</td>
</tr>
</tbody>
</table>
INTSTO

This COMMON block contains intermediate spectral data the integrated in-band values.

Common Block INTSTO used in:

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RADSH(NASMAX, NZSMAX)</td>
<td>REAL</td>
<td>Spectral earth/skyshine thermal radiance (W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>TAUSH(NASMAX, NZSMAX)</td>
<td>REAL</td>
<td>Spectral skyshine transmittance</td>
</tr>
<tr>
<td>RADSE(NASMAX, NZSMAX)</td>
<td>REAL</td>
<td>Spectral earth/skyshine terminator emitted radiance (W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>RADSS(NASMAX, NZSMAX)</td>
<td>REAL</td>
<td>Spectral earth/skyshine terminator reflected radiance (W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>RADSHT(NASMAX, NZSMAX,NGMAX)</td>
<td>REAL</td>
<td>Integrated Earth/Skyshine Thermal Radiance (W/cm²/sr)</td>
</tr>
<tr>
<td>TAUSHT(NASMAX, NZSMAX,NGMAX)</td>
<td>REAL</td>
<td>Integrated earth/skyshine transmittance</td>
</tr>
<tr>
<td>RADSET(NASMAX, NZSMAX,NGMAX)</td>
<td>REAL</td>
<td>Integrated earth/skyshine terminator emitted radiance (W/cm²/sr)</td>
</tr>
<tr>
<td>RADSST(NASMAX, NZSMAX,NGMAX)</td>
<td>REAL</td>
<td>Integrated earth/skyshine terminator reflected radiance (W/cm²/sr)</td>
</tr>
<tr>
<td>RADSC(NASMAX, NZSMAX)</td>
<td>REAL</td>
<td>Spectral earth/skyshine scattered radiance (W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>RADSCST(NASMAX, NZSMAX,NGMAX)</td>
<td>REAL</td>
<td>Integrated earth/skyshine scattered radiance (W/cm²/sr)</td>
</tr>
<tr>
<td>RSLSTT(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated scattered observer-source line-of-sight radiance (W/cm²/sr)</td>
</tr>
<tr>
<td>Variable</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>RSLSBT(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated scattered observer-background line-of-sight radiance (W/cm²/sr)</td>
</tr>
<tr>
<td>RADBIE(NAZMAX)</td>
<td>REAL</td>
<td>Spectral emitted observer line-of-sight terminator radiance (W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>RADBET(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated emitted observer line-of-sight terminator radiance (W/cm²/sr)</td>
</tr>
<tr>
<td>RADBR(NAZMAX)</td>
<td>REAL</td>
<td>Spectral reflected observer line-of-sight terminator radiance (W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>RADBRT(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated reflected observer line-of-sight terminator radiance (W/cm²/sr)</td>
</tr>
<tr>
<td>RADSD(NAZMAX)</td>
<td>REAL</td>
<td>Spectral terminator radiance standard deviation (W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>RADSDT(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated terminator radiance standard deviation (W/cm²/sr)</td>
</tr>
<tr>
<td>TAU1(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Spectral observer-source transmittance</td>
</tr>
<tr>
<td>TAU2(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Spectral observer-background transmittance</td>
</tr>
<tr>
<td>SGMETT(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated source scintillation</td>
</tr>
<tr>
<td>SGMEBT(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated background scintillation</td>
</tr>
<tr>
<td>TASCTT(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated forward in-scatter transmittance to source</td>
</tr>
<tr>
<td>TASCBT(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated forward in-scatter transmittance to background</td>
</tr>
<tr>
<td>RAD1(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated thermal path radiance observer-source line-of-sight (W/cm²/sr)</td>
</tr>
<tr>
<td>Symbol</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>RAD2(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated thermal path radiance observer-background line-of-sight (W/cm²/sr)</td>
</tr>
<tr>
<td>RDSLNT(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated source solar irradiance (W/cm²)</td>
</tr>
<tr>
<td>RDLNT(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated source lunar irradiance (W/cm²)</td>
</tr>
<tr>
<td>DRADTT(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated path standard deviation observer-source line-of-sight (W/cm²/sr)</td>
</tr>
<tr>
<td>DRADB1(NAZMAX, NGMAX)</td>
<td>REAL</td>
<td>Integrated path standard deviation observer-background line-of-sight (W/cm²/sr)</td>
</tr>
<tr>
<td>BCKSUM(2,NMATL, NAZMAX,NGMAX)</td>
<td>REAL</td>
<td>Integrated terrain material radiances in sun and shade (W/cm²/sr)</td>
</tr>
</tbody>
</table>
INUAEER

This COMMON block contains the sample user-defined aerosol input file.

Common Block INUAER used in:
   CRUAER   INARBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPAER(32)</td>
<td>CHARACTER*60</td>
<td>Aerosol file records</td>
</tr>
</tbody>
</table>
INUCLD

This COMMON block contains the sample user-defined hydrometeor input file.

Common Block INUCLD used in:
   CRUCLD   INCLBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPCLD(30)</td>
<td>CHARACTER*80</td>
<td>User-defined hydrometeor file records</td>
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</table>
**KDISDT**

This COMMON block contains the parameters for the exponential sum fit used in the multiple scattering calculations.

Common Block KDISDT used in:  
  KDISTR  PRCALC

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXTNCA(MLMAX,</td>
<td>REAL</td>
<td>Extinction coefficient (km⁻¹)</td>
</tr>
<tr>
<td>MAXLAT,MAXLON)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALBA(MLMAX,</td>
<td>REAL</td>
<td>Aerosol albedo</td>
</tr>
<tr>
<td>MAXLAT,MAXLON)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALBM(MLMAX,</td>
<td>REAL</td>
<td>Molecular albedo</td>
</tr>
<tr>
<td>MAXLAT,MAXLON)</td>
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</tr>
</tbody>
</table>
LAGUER

This COMMON block contains Gauss-Laguerre coefficients.

Common Block LAGUER used in:
   ESFIT   LAGRBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XLGA(2)</td>
<td>DOUBLE PRECISION</td>
<td>2-point Gauss-Laguerre abscissa</td>
</tr>
<tr>
<td>WLGA(2)</td>
<td>DOUBLE PRECISION</td>
<td>2-point Gauss-Laguerre weights</td>
</tr>
<tr>
<td>WLGEXA(2)</td>
<td>DOUBLE PRECISION</td>
<td>2-point Gauss-Laguerre weights time (\exp(-XLG2))</td>
</tr>
<tr>
<td>XLGB(3)</td>
<td>DOUBLE PRECISION</td>
<td>3-point Gauss-Laguerre abscissa</td>
</tr>
<tr>
<td>WLGB(3)</td>
<td>DOUBLE PRECISION</td>
<td>3-point Gauss-Laguerre weights</td>
</tr>
<tr>
<td>WLGEXB(3)</td>
<td>DOUBLE PRECISION</td>
<td>3-point Gauss-Laguerre weights time (\exp(-XLG3))</td>
</tr>
<tr>
<td>XLGC(4)</td>
<td>DOUBLE PRECISION</td>
<td>4-point Gauss-Laguerre abscissa</td>
</tr>
<tr>
<td>WLGC(4)</td>
<td>DOUBLE PRECISION</td>
<td>4-point Gauss-Laguerre weights</td>
</tr>
<tr>
<td>WLGEXC(4)</td>
<td>DOUBLE PRECISION</td>
<td>4-point Gauss-Laguerre weights time (\exp(-XLG4))</td>
</tr>
<tr>
<td>XLGD(5)</td>
<td>DOUBLE PRECISION</td>
<td>5-point Gauss-Laguerre abscissa</td>
</tr>
<tr>
<td>WLGD(5)</td>
<td>DOUBLE PRECISION</td>
<td>5-point Gauss-Laguerre weights</td>
</tr>
<tr>
<td>WLGEXD(5)</td>
<td>DOUBLE PRECISION</td>
<td>5-point Gauss-Laguerre weights time (\exp(-XLG5))</td>
</tr>
<tr>
<td>XLGE(6)</td>
<td>DOUBLE PRECISION</td>
<td>6-point Gauss-Laguerre abscissa</td>
</tr>
<tr>
<td>WLGE(6)</td>
<td>DOUBLE PRECISION</td>
<td>6-point Gauss-Laguerre weights</td>
</tr>
<tr>
<td>WLGEXE(6)</td>
<td>DOUBLE PRECISION</td>
<td>6-point Gauss-Laguerre weights time (\exp(-XLG6))</td>
</tr>
<tr>
<td>XLGF(7)</td>
<td>DOUBLE PRECISION</td>
<td>7-point Gauss-Laguerre abscissa</td>
</tr>
<tr>
<td>WLGF(7)</td>
<td>DOUBLE PRECISION</td>
<td>7-point Gauss-Laguerre weights</td>
</tr>
<tr>
<td>WLGEXF(7)</td>
<td>DOUBLE PRECISION</td>
<td>7-point Gauss-Laguerre weights time (\exp(-XLG7))</td>
</tr>
<tr>
<td>XLLG(8)</td>
<td>DOUBLE PRECISION</td>
<td>8-point Gauss-Laguerre abscissa</td>
</tr>
<tr>
<td>WLLG(8)</td>
<td>DOUBLE PRECISION</td>
<td>8-point Gauss-Laguerre weights</td>
</tr>
<tr>
<td>WLGEXG(8)</td>
<td>DOUBLE PRECISION</td>
<td>8-point Gauss-Laguerre weights time (\exp(-XLG8))</td>
</tr>
<tr>
<td>XLGH(9)</td>
<td>DOUBLE PRECISION</td>
<td>9-point Gauss-Laguerre abscissa</td>
</tr>
<tr>
<td>WLGH(9)</td>
<td>DOUBLE PRECISION</td>
<td>9-point Gauss-Laguerre weights</td>
</tr>
<tr>
<td>WLGEXH(9)</td>
<td>DOUBLE PRECISION</td>
<td>9-point Gauss-Laguerre weights time (\exp(-XLG9))</td>
</tr>
<tr>
<td>Function</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>XLGI(10)</td>
<td>DOUBLE PRECISION</td>
<td>10-point Gauss-Laguerre abscissa</td>
</tr>
<tr>
<td>WLGJ(12)</td>
<td>DOUBLE PRECISION</td>
<td>12-point Gauss-Laguerre weights</td>
</tr>
<tr>
<td>WLGJX(10)</td>
<td>DOUBLE PRECISION</td>
<td>10-point Gauss-Laguerre weights with time ( \exp(-X_{LG10}) )</td>
</tr>
<tr>
<td>XLGJ(12)</td>
<td>DOUBLE PRECISION</td>
<td>12-point Gauss-Laguerre abscissa</td>
</tr>
<tr>
<td>WLGJX(12)</td>
<td>DOUBLE PRECISION</td>
<td>12-point Gauss-Laguerre weights with time ( \exp(-X_{LG12}) )</td>
</tr>
<tr>
<td>XLGK(15)</td>
<td>DOUBLE PRECISION</td>
<td>15-point Gauss-Laguerre abscissa</td>
</tr>
<tr>
<td>WLGK(15)</td>
<td>DOUBLE PRECISION</td>
<td>15-point Gauss-Laguerre weights</td>
</tr>
<tr>
<td>WLGEXK(15)</td>
<td>DOUBLE PRECISION</td>
<td>15-point Gauss-Laguerre weights with time ( \exp(-X_{LG15}) )</td>
</tr>
</tbody>
</table>
**LYRSTO**

This COMMON block contains the irradiance parameters for each layer in the atmospheric profile.

Common Block LYRSTO used in:
- COUPLE
- INICPL
- MLSCAT
- PRCALC
- PTHOSB
- RSHINE
- SCNRIIO

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLNK(MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Blackbody spectral radiance for layer temperature (W/cm²/sr/cm³)</td>
</tr>
<tr>
<td>SOLYR(MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Solar spectral irradiance (W/cm²/cm³)</td>
</tr>
<tr>
<td>XLNLYR(MLMAX, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Lunar spectral irradiance (W/cm²/cm³)</td>
</tr>
<tr>
<td>USOLAR(MLMAX, NBAND, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Upward diffuse reflection term for sun per exponential fit band</td>
</tr>
<tr>
<td>DSOLAR(MLMAX, NBAND, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Downward diffuse reflection term for sun per exponential fit band</td>
</tr>
<tr>
<td>ULUNAR(MLMAX, NBAND, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Upward diffuse reflection term for moon per exponential fit band</td>
</tr>
<tr>
<td>DLUNAR(MLMAX, NBAND, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Downward diffuse reflection term for moon per exponential fit band</td>
</tr>
<tr>
<td>RAYER(0:MLMAX+1, NBAND, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Layer reflectance</td>
</tr>
<tr>
<td>TLAYER(0:MLMAX+1, NBAND, MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Layer transmittance</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI(0:MLMAX+1, NBAND)</td>
<td>REAL</td>
<td>Multiple scattered downward flux (thermal/solar) for each exponential fit band (W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>HPI(0:MLMAX+1, NBAND)</td>
<td>REAL</td>
<td>Multiple scattered upward flux (thermal/solar) for each exponential fit band (W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>SOLEV(LMLAX)</td>
<td>REAL</td>
<td>Solar elevation angle (deg)</td>
</tr>
<tr>
<td>XLNEVL(MLMAX)</td>
<td>REAL</td>
<td>Lunar elevation angle (deg)</td>
</tr>
<tr>
<td>HP(2,MLMAX, MAXLAT, MAXLON NSPCMNX)</td>
<td>REAL</td>
<td>Total multiple scattered upward flux (thermal/solar) (W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>HM(2,MLMAX, MAXLAT, MAXLON NSPCMNX)</td>
<td>REAL</td>
<td>Total multiple scattered downward flux (thermal/solar) (W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>DPLKDT(MLMAX, MAXLAT, MAXLON NSPCMNX)</td>
<td>REAL</td>
<td>Derivative of Planck blackbody function with temperature (W/cm²/sr/cm⁻¹/K)</td>
</tr>
</tbody>
</table>
MACHIN

This COMMON block contains the machine indices for machine dependent operations.

Common Block MACHIN used in:

- CRBKGD  CRFLTR  CRINPT  CRUAER  CRUATM  CRUCLD
- DEVCBD  FPTEST  FSTAT

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICMPTR(2)</td>
<td>INTEGER</td>
<td>Machine-dependent indices</td>
</tr>
<tr>
<td>LRMAX</td>
<td>INTEGER</td>
<td>Maximum allowed record length</td>
</tr>
</tbody>
</table>
This COMMON block contains the parameters for the materials used in the user-defined aerosol model.

**Common Block MATERL used in:**
- DNDR
- MIEINP
- MIEPHS

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XN(3,100,5)</td>
<td>COMPLEX</td>
<td>Spectral indices of refraction for two core materials and core material</td>
</tr>
<tr>
<td>NSD(5)</td>
<td>INTEGER</td>
<td>Number of points in user-defined size distribution</td>
</tr>
<tr>
<td>SIG(5)</td>
<td>REAL</td>
<td>Standard deviation for log normal size distribution</td>
</tr>
<tr>
<td>R0(5)</td>
<td>REAL</td>
<td>Mean radius for log normal or breakpoint radius for Junge size distribution (µm)</td>
</tr>
<tr>
<td>SNU(5)</td>
<td>REAL</td>
<td>Junge size distribution parameter</td>
</tr>
<tr>
<td>REFF(5)</td>
<td>REAL</td>
<td>Effective radius for Hansen size distribution (µm)</td>
</tr>
<tr>
<td>VEFF(5)</td>
<td>REAL</td>
<td>Effective variance for Hansen size distribution</td>
</tr>
<tr>
<td>ALPHA(5)</td>
<td>REAL</td>
<td>Modified Gamma size distribution parameter</td>
</tr>
<tr>
<td>GAMMA(5)</td>
<td>REAL</td>
<td>Modified Gamma size distribution parameter</td>
</tr>
<tr>
<td>B(5)</td>
<td>REAL</td>
<td>Modified Gamma size distribution parameter</td>
</tr>
<tr>
<td>SDIST(50,5)</td>
<td>REAL</td>
<td>User-defined size distribution</td>
</tr>
<tr>
<td>PCT(5)</td>
<td>REAL</td>
<td>Fraction of particle radius that is core</td>
</tr>
<tr>
<td>RDCOTI(5)</td>
<td>REAL</td>
<td>Initial particle radius (µm)</td>
</tr>
<tr>
<td>RDCOTF(5)</td>
<td>REAL</td>
<td>Final particle radius (µm)</td>
</tr>
<tr>
<td>WLAU(100,5)</td>
<td>REAL</td>
<td>Wavelength (µm)</td>
</tr>
<tr>
<td>NWLAU(5)</td>
<td>INTEGER</td>
<td>Number of spectral points</td>
</tr>
<tr>
<td>NINTR(5)</td>
<td>INTEGER</td>
<td>Number of integration points</td>
</tr>
<tr>
<td></td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>ITYPEP(5)</td>
<td>INTEGER</td>
<td>Particle size distribution index</td>
</tr>
<tr>
<td>ITYPEI(5)</td>
<td>INTEGER</td>
<td>Core inclusion index</td>
</tr>
<tr>
<td>ITYPEM(3,5)</td>
<td>INTEGER</td>
<td>Material indices for core (2) and coating</td>
</tr>
<tr>
<td>FR1(5)</td>
<td>REAL</td>
<td>Fraction of core that is first material</td>
</tr>
</tbody>
</table>
MIECOT

This COMMON block contains the scattering matrix components used in the Mie calculations.

Common Block MIECOT used in:
    COAT       MIE  MIEPHS

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1(NXMIE)</td>
<td>COMPLEX</td>
<td>Unknown parameter</td>
</tr>
<tr>
<td>S2(NXMIE)</td>
<td>COMPLEX</td>
<td>Unknown parameter</td>
</tr>
<tr>
<td>S11(NXMIE)</td>
<td>REAL</td>
<td>(1,1)- and (2,2)-element of the Mueller matrix times PI times scattering efficiency divided the wavelength squared</td>
</tr>
<tr>
<td>S12(NXMIE)</td>
<td>REAL</td>
<td>(1,2)- and (2,1)-element of the Mueller matrix times PI times scattering efficiency divided the wavelength squared</td>
</tr>
<tr>
<td>S33(NXMIE)</td>
<td>REAL</td>
<td>(3,3)- and (4,4)-element of the Mueller matrix times PI times scattering efficiency divided the wavelength squared</td>
</tr>
<tr>
<td>S34(NXMIE)</td>
<td>REAL</td>
<td>(3,4)- and minus the (4,3)-element of the Mueller matrix times PI times scattering efficiency divided by the wavelength squared</td>
</tr>
<tr>
<td>AMU(NXMIE)</td>
<td>REAL</td>
<td>Cosine of scattering angle</td>
</tr>
<tr>
<td>PII(NXMIE,2)</td>
<td>REAL</td>
<td>Unknown parameter</td>
</tr>
</tbody>
</table>
**MMWREF**

This COMMON block contains the parameters for calculating millimeter wave refractivity.

Common Block MMWREF used in:
- REFRAC
- REFRBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRQO2(42)</td>
<td>REAL</td>
<td>Oxygen line frequencies (GHz)</td>
</tr>
<tr>
<td>SO2(42)</td>
<td>REAL</td>
<td>Oxygen line strengths at 300 K</td>
</tr>
<tr>
<td>ALFO2(42)</td>
<td>REAL</td>
<td>Oxygen line widths at 300 K (GHz/torr)</td>
</tr>
<tr>
<td>PINTER(42)</td>
<td>REAL</td>
<td>Interference parameter at 300 K</td>
</tr>
<tr>
<td>TINTER(42)</td>
<td>REAL</td>
<td>Interference temperature correction</td>
</tr>
<tr>
<td>LQPO2(42)</td>
<td>INTEGER</td>
<td>Oxygen line quantum parameter</td>
</tr>
<tr>
<td>VH20(56)</td>
<td>REAL</td>
<td>Water vapor line frequencies (GHz)</td>
</tr>
<tr>
<td>SH20(56)</td>
<td>REAL</td>
<td>Water vapor line strengths</td>
</tr>
<tr>
<td>ALFH20(56)</td>
<td>REAL</td>
<td>Water vapor line widths (cm⁻¹/torr)</td>
</tr>
<tr>
<td>ELSH20(56)</td>
<td>REAL</td>
<td>Ground energy state (K)</td>
</tr>
</tbody>
</table>
MOLCON

This COMMON block contains the parameters for the molecular concentrations.

Common Block MOLCON used in:

BMOD    BNDPAR    BRBNDR    ENDPT    EQABS    EQUABS
LOWTRN  MOLPBD    PLMSUB    PRCALC    PRETEM    PUTHDR
SCNRIO  TANGPT

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMOL(28,MLIDMX,MLMAX,MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Molecular concentrations (ppmv)</td>
</tr>
<tr>
<td>NNN</td>
<td>INTEGER</td>
<td>Number of molecules used in plume binary output file</td>
</tr>
</tbody>
</table>
MOLDAT

This COMMON block contains the parameters for the molecular partition functions.

Common Block MOLDAT used in:

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NW(MLIDMX)</td>
<td>INTEGER</td>
<td>Number of energy levels for vibration partition function</td>
</tr>
<tr>
<td>WMOL(MLIDMX,10)</td>
<td>REAL</td>
<td>Energy levels for vibration partition function</td>
</tr>
<tr>
<td>NDEG(MLIDMX,10)</td>
<td>INTEGER</td>
<td>Degeneracy of each energy level for vibration partition function</td>
</tr>
<tr>
<td>XK(MLIDMX)</td>
<td>REAL</td>
<td>Exponent for rotational partition function</td>
</tr>
<tr>
<td>AIRMWT</td>
<td>REAL</td>
<td>Molecular weight of air</td>
</tr>
<tr>
<td>AMWT(MLIDMX)</td>
<td>REAL</td>
<td>Molecular weights</td>
</tr>
</tbody>
</table>
MOLECP

This COMMON block contains indexing information for each molecule in the direct access binary data files.

Common Block MOLECP used in:
ABSMOL  BAND  BBARSL  BMOD  BNDPAR  DBINIT
DFLT8  DVINCR  EMISSV  ENDPT  EQABS  EQUABS
KDISTR  PLMSUB  PRCALC  PTHOSB  PTHTAU  PUTHDR
SCNRIO  SUMFIL  TANGPT  USRDEF  BBTEMP  VISUAL

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMOLEC</td>
<td>INTEGER</td>
<td>Number of molecules</td>
</tr>
<tr>
<td>MOLID(MLIDMX)</td>
<td>INTEGER</td>
<td>Molecular index (see Section 7.0)</td>
</tr>
<tr>
<td>NVA(MLIDMX)</td>
<td>INTEGER</td>
<td>Number of spectral groups in binary data files</td>
</tr>
<tr>
<td>VA(30,MLIDMX)</td>
<td>REAL</td>
<td>Initial wavenumber (cm(^{-1})) for spectral group</td>
</tr>
<tr>
<td>VB(30,MLIDMX)</td>
<td>REAL</td>
<td>Final wavenumber (cm(^{-1})) for spectral group</td>
</tr>
<tr>
<td>IVA(30,MLIDMX)</td>
<td>INTEGER</td>
<td>Direct access record number for the beginning of each spectral group</td>
</tr>
<tr>
<td>DVM(MLIDMX)</td>
<td>REAL</td>
<td>Spectral resolution (cm(^{-1}))</td>
</tr>
<tr>
<td>DVREF</td>
<td>REAL</td>
<td>Reference spectral increment in molecular data bases (cm(^{-1}))</td>
</tr>
<tr>
<td>IPLUM(6)</td>
<td>INTEGER</td>
<td>Plume molecular index</td>
</tr>
</tbody>
</table>
MSPARM

This COMMON block contains the exponential sum fit parameters for the multiple scattering calculations.

Common Block MSPARM used in:
   COUPLE INICPL PRCALC

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMS(NBAND,</td>
<td>REAL</td>
<td>Weights</td>
</tr>
<tr>
<td>MLMAX,MAXLAT,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAXLON)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XKMS(NBAND,</td>
<td>REAL</td>
<td>Exponential terms</td>
</tr>
<tr>
<td>MLMAX,MAXLAT,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAXLON)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**NAVMAR**

This COMMON block contains the parameters for the Navy Aerosol Model.

Common Block NAVMAR used in:
MARINE  MARNBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TQEXT(3,40,4)</td>
<td>REAL</td>
<td>Extinction coefficient (km(^{-1})) as a function of wind speed, wavelength, and relative humidity</td>
</tr>
<tr>
<td>TQABS(3,40,4)</td>
<td>REAL</td>
<td>Absorption coefficient (km(^{-1})) as a function of wind speed, wavelength, and relative humidity</td>
</tr>
<tr>
<td>WL(40)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>RELHUM(4)</td>
<td>REAL</td>
<td>Relative humidity</td>
</tr>
</tbody>
</table>
**NO2XS**

This COMMON block contains the cross-sections of nitrogen dioxide between 14,095 and 49,970 cm\(^{-1}\).

Common Block NO2XS used in:
- ABSNO2
- NO2BD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBEG</td>
<td>REAL</td>
<td>Initial wavenumber (cm(^{-1}))</td>
</tr>
<tr>
<td>VEND</td>
<td>REAL</td>
<td>Final wavenumber (cm(^{-1}))</td>
</tr>
<tr>
<td>VINCR</td>
<td>REAL</td>
<td>Wavenumber increment (cm(^{-1}))</td>
</tr>
<tr>
<td>CRSNO2(NMAX)</td>
<td>REAL</td>
<td>Cross-section of nitrogen dioxide</td>
</tr>
</tbody>
</table>
O3CWB

This COMMON block contains the cross-section of the Chappuis and Wulf band of ozone between 9,170 and 24,565 cm\(^{-1}\).

Common Block O3CWB used in:
    ABSO3    O3CWBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBEG</td>
<td>REAL</td>
<td>Initial wavenumber (cm(^{-1}))</td>
</tr>
<tr>
<td>VEND</td>
<td>REAL</td>
<td>Final wavenumber (cm(^{-1}))</td>
</tr>
<tr>
<td>VINCR</td>
<td>REAL</td>
<td>Wavenumber increment (cm(^{-1}))</td>
</tr>
<tr>
<td>CT0(NMAX)</td>
<td>REAL</td>
<td>Zeroth order parameter for cross-section (amagat(^{-1}) cm(^{-1}))</td>
</tr>
<tr>
<td>CT1(NMAX)</td>
<td>REAL</td>
<td>First order parameter for cross-section (amagat(^{-1}) cm(^{-1}) K(^{-1}))</td>
</tr>
<tr>
<td>CT2(NMAX)</td>
<td>REAL</td>
<td>Second order parameter for cross-section (amagat(^{-1}) cm(^{-1}) K(^{-2}))</td>
</tr>
</tbody>
</table>
O3PAR

This COMMON block contains the LOWTRAN band parameters of ozone.

Common Block O3PAR used in:
CPO3BD    LOWTRN

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPO3(447)</td>
<td>REAL</td>
<td>LOWTRAN band model parameters for ozone</td>
</tr>
</tbody>
</table>
OMATLW

This COMMON block contains the altitude arrays used in the broadband heat transfer calculations.

Common Block OMATLW used in:

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULW(10,10)</td>
<td>REAL</td>
<td>Optical path matrix for water vapor</td>
</tr>
<tr>
<td>VLW(10,10)</td>
<td>REAL</td>
<td>Optical path matrix for carbon dioxide</td>
</tr>
<tr>
<td>WLW(10,10)</td>
<td>REAL</td>
<td>Optical path matrix for ozone</td>
</tr>
<tr>
<td>XLW(10,10,2)</td>
<td>REAL</td>
<td>Optical path matrix for aerosol scattering</td>
</tr>
<tr>
<td>YLW(10,10)</td>
<td>REAL</td>
<td>Optical path matrix for Rayleigh scattering</td>
</tr>
<tr>
<td>ZLW(10,10,2)</td>
<td>REAL</td>
<td>Optical path matrix for aerosol absorption</td>
</tr>
<tr>
<td>TU(10,10)</td>
<td>REAL</td>
<td>Temperature-weighted optical path matrix for water vapor</td>
</tr>
<tr>
<td>TV(10,10)</td>
<td>REAL</td>
<td>Temperature-weighted optical path matrix for carbon dioxide</td>
</tr>
<tr>
<td>TW(10,10)</td>
<td>REAL</td>
<td>Temperature-weighted optical path matrix for ozone</td>
</tr>
<tr>
<td>TX(10,10)</td>
<td>REAL</td>
<td>Temperature-weighted optical path matrix for aerosols</td>
</tr>
<tr>
<td>TM(10,10)</td>
<td>REAL</td>
<td>Effective temperature (K) matrix</td>
</tr>
<tr>
<td>TF(10,10)</td>
<td>REAL</td>
<td>Transmission matrix</td>
</tr>
</tbody>
</table>
OPTDEP

This COMMON block contains the optical depths for the various atmospheric constituents.

Common Block OPTDEP used in:
   PRCALC   PTHTAU   RSHINE

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XSS(ISMX,MLMX2)</td>
<td>DOUBLE PRECISION</td>
<td>Optical depth for each atmospheric constituent at each point along the ray</td>
</tr>
</tbody>
</table>
OUTPUT

This COMMON block contains the switch that controls the ASCII output.

Common Block OUTPUT used in:

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPRNDX</td>
<td>INTEGER</td>
<td>ASCII output length index</td>
</tr>
</tbody>
</table>
**O2C**

This COMMON block contains the parameters for the molecular oxygen continuum.

Common Block O2C used in:
- O2CBD
- O2CNT

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPTO2</td>
<td>INTEGER</td>
<td>Number of spectral points</td>
</tr>
<tr>
<td>VO2(2)</td>
<td>REAL</td>
<td>Initial and final wavenumbers (cm⁻¹)</td>
</tr>
<tr>
<td>DVO2</td>
<td>REAL</td>
<td>Incremental wavenumber (cm⁻¹)</td>
</tr>
<tr>
<td>O2S0(74)</td>
<td>REAL</td>
<td>Absorption coefficient (amagat⁻¹ cm⁻¹)</td>
</tr>
<tr>
<td>O2A(74)</td>
<td>REAL</td>
<td>Temperature dependent coefficient (K⁻¹)</td>
</tr>
<tr>
<td>O2B(74)</td>
<td>REAL</td>
<td>Temperature dependent coefficient (K⁻²)</td>
</tr>
</tbody>
</table>
O3HHB

This COMMON block contains the parameters for the Hartley-Huggins band of ozone in the visible and ultraviolet.

Common Block O3HHB used in:
    ABSO3     O3HHBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1C</td>
<td>REAL</td>
<td>Initial wavenumber (cm(^{-1})) for 27370 - 29400 cm(^{-1}) region</td>
</tr>
<tr>
<td>V2C</td>
<td>REAL</td>
<td>Final wavenumber (cm(^{-1})) for 27370 - 29400 cm(^{-1}) region</td>
</tr>
<tr>
<td>DVC</td>
<td>REAL</td>
<td>Wavenumber increment (cm(^{-1}))</td>
</tr>
<tr>
<td>NC</td>
<td>INTEGER</td>
<td>Number of spectral points</td>
</tr>
<tr>
<td>CO3DT(3,2687)</td>
<td>REAL</td>
<td>Absorption coefficient (amagat(^{-1}) cm(^{-1}))</td>
</tr>
<tr>
<td>V1O</td>
<td>REAL</td>
<td>Initial wavenumber (cm(^{-1})) for 40800 - 54054 cm(^{-1}) region</td>
</tr>
<tr>
<td>V2O</td>
<td>REAL</td>
<td>Final wavenumber (cm(^{-1})) for 40800 - 54054 cm(^{-1}) region</td>
</tr>
<tr>
<td>DVO</td>
<td>REAL</td>
<td>Wavenumber increment (cm(^{-1}))</td>
</tr>
<tr>
<td>NO</td>
<td>INTEGER</td>
<td>Number of spectral points</td>
</tr>
<tr>
<td>CO3DAT(133)</td>
<td>REAL</td>
<td>Absorption coefficient (amagat(^{-1}) cm(^{-1}))</td>
</tr>
</tbody>
</table>
**PATH1**

This COMMON block contains various parameters for the observer-source-background path. See Figure 3.

Common Block PATH1 used in:
- CALCUL
- PLMSUB
- PRCALC
- PTHOSB
- SCNRIO
- SRCGEO

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSRCE</td>
<td>INTEGER</td>
<td>Number of points between observer and source</td>
</tr>
<tr>
<td>NBKGD</td>
<td>INTEGER</td>
<td>Number of points between observer and background</td>
</tr>
<tr>
<td>DOSB(MLMX2)</td>
<td>REAL</td>
<td>Differential slant ranges (km) between observer and source-background</td>
</tr>
<tr>
<td>IOSB(MLMX2)</td>
<td>INTEGER</td>
<td>Pointers to altitude profile along the observer-source-background path</td>
</tr>
<tr>
<td>VARXZ(MLMX2, NAZMAX)</td>
<td>REAL</td>
<td>Scintillation parameter along the observer-source-background path</td>
</tr>
<tr>
<td>RSCINT(MLMX2)</td>
<td>REAL</td>
<td>Running sum of DOSB (km)</td>
</tr>
<tr>
<td>SOLEVNB(NAZMAX)</td>
<td>REAL</td>
<td>Solar elevation angle at background (rad)</td>
</tr>
<tr>
<td>XLNEVB(NAZMAX)</td>
<td>REAL</td>
<td>Lunar elevation angle at background (rad)</td>
</tr>
<tr>
<td>PHIOSB(MLMX2)</td>
<td>REAL</td>
<td>Elevation angle (rad) along the observer-source-background path</td>
</tr>
<tr>
<td>ACCAPT(2)</td>
<td>REAL</td>
<td>Sensor aperture acceptance angle (rad) for forward in-scatter along the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>observer-source-background path</td>
</tr>
<tr>
<td>THOSB(MLMX2)</td>
<td>REAL</td>
<td>Earth center angle (rad) along the observer-source-background path</td>
</tr>
</tbody>
</table>
Figure 3. Observer-Source-Background Path. COMMON Block: PATH1.
**PATH1A**

Common Block PATH1A used in:
- CALCUL
- PLMSUB
- PRCALC
- SCNRIO

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTHLAT(MLMX2, NAZMAX)</td>
<td>REAL</td>
<td>Latitude along path (deg)</td>
</tr>
<tr>
<td>PTHLON(MLMX2, NAZMAX)</td>
<td>REAL</td>
<td>Longitude along path (deg)</td>
</tr>
<tr>
<td>PTHFAC(MAXLAT, MAXLON,MLMX2, NAZMAX)</td>
<td>REAL</td>
<td>Interpolation factor along path</td>
</tr>
<tr>
<td>NPTHFC(2,2, NAZMAX)</td>
<td>INTEGER</td>
<td>Limits of grid where geometry is valid</td>
</tr>
<tr>
<td>FRSNW(NAZMAX)</td>
<td>REAL</td>
<td>Fraction snow in terrain</td>
</tr>
<tr>
<td>FRWTR(NAZMAX)</td>
<td>REAL</td>
<td>Fraction water in terrain</td>
</tr>
<tr>
<td>FRICE(NAZMAX)</td>
<td>REAL</td>
<td>Fraction ice in terrain</td>
</tr>
</tbody>
</table>
PATH2

This COMMON block contains the parameters for the earth/skyshine rays at the source paths. See Figure 4.

Common Block PATH2 used in:
   RSHINE    SRCIRR

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSH</td>
<td>INTEGER</td>
<td>Number of points along each earth/skyshine path</td>
</tr>
<tr>
<td>DRSH(MLMX2)</td>
<td>REAL</td>
<td>Differential slant ranges (km) along each earth/skyshine path</td>
</tr>
<tr>
<td>ISH(MLMX2)</td>
<td>INTEGER</td>
<td>Pointer to altitude profile along each earth/skyshine path</td>
</tr>
<tr>
<td>PHISHL(MLMX2)</td>
<td>REAL</td>
<td>Elevation angles (rad) along each earth/skyshine path</td>
</tr>
<tr>
<td>SHNFAC(MAXLAT, MAXLON, MLMX2, NZSMAX)</td>
<td>REAL</td>
<td>Interpolation factor for global atmosphere for each point along earth/skyshine path</td>
</tr>
<tr>
<td>SHSNW(NZSMAX)</td>
<td>REAL</td>
<td>Fraction snow cover on terrain at path end</td>
</tr>
<tr>
<td>SHICE(NZSMAX)</td>
<td>REAL</td>
<td>Fraction ice on terrain at path end</td>
</tr>
<tr>
<td>SHWTR(NZSMAX)</td>
<td>REAL</td>
<td>Fraction water on terrain at path end</td>
</tr>
<tr>
<td>NSHNFC(2,2, NSHNFC)</td>
<td>INTEGER</td>
<td>Limits of grid where geometry is valid</td>
</tr>
</tbody>
</table>
Figure 4. Sky/Earthshine Ray Path at Source. There is a set of paths for each user-specified observer-source azimuth angle. COMMON Block: PATH3.
PATH2A

This COMMON block contains the parameters for each intermediate point along a source earth/skyshine ray to the sun. See Figure 5. For example, for each skyshine ray, if there are 3 different azimuth angles, and there are 10 intermediate points along each of the skyshine rays, there will be a total of 30 path dealt with in this COMMON block.

Common Block PATH2A used in:
   RSHINE       SRCIRR

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSHSL(NZSMAX, MLMX2,NASMAX)</td>
<td>INTEGER</td>
<td>Number of points along each ray between each point along the points along an earth/skyshine path and the sun</td>
</tr>
<tr>
<td>ISHSL(ISSMAX)</td>
<td>INTEGER</td>
<td>Pointers to the altitude profile along each earth/skyshine-solar path; since there are 4*32 = 128 possible earth/skyshine paths, and up to 200 points for each path, there 25,600 points; each point has a ray to the sun with up to 200 points each, so there can be up to 5.12 million points possible; tests have shown that ISSMAX will handle most reasonable geometries; if the total number of points exceeds ISSMAX, these values are written to a scratch file and a warning message is given.</td>
</tr>
</tbody>
</table>
PATH2A (continued)

- DRSHSL(ISTMAX) REAL  Differential slant ranges (km) along each earth/skyshine-solar path; since there are $4 \times 32 = 128$ possible earth/skyshine paths, and up to 200 points for each path, there 25,600 points; each point has a ray to the sun with up to 200 points each, so there can be up to 5.12 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.

- SSLFAC(MAXLAT, MAXLON, ISTMAX) REAL  Interpolation factor for latitude variations in global atmosphere for each point along earth/skyshine-solar path

- NSSLFC(2,2) INTEGER  Limits of grid where geometry is valid
Figure 5. Sky/Earthshine Rays at Source Intermediate Point-to-Sun Paths. There is a set of paths as shown above for each user-specified receiver-target azimuth angle. COMMON Blocks: PATH 2A, 2B, 2C, 2H, 2I, 2J, 2L, 2M, 2N.
**PATH2B**

This COMMON block contains the parameters for each intermediate point along a source earth/skyshine ray to the sun. See Figure 5. For example, for each skyshine ray, if there are 3 different azimuth angles, and there are 10 intermediate points along each of the skyshine rays, there will be a total of 270 path dealt with in this COMMON block.

Common Block PATH2B used in:
- RSHINE
- SRCIRI

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDXSH(NZSMAX, MLMX2)</td>
<td>INTEGER</td>
<td>Pointers to the starting position of each path</td>
</tr>
<tr>
<td>SCTNGS(NZSMAX, MLMX2)</td>
<td>REAL</td>
<td>Solar scattering angle (deg) along earth/skyshine paths</td>
</tr>
<tr>
<td>SLEVSH(NZSMAX)</td>
<td>REAL</td>
<td>Solar elevation angle (deg) at earth/skyshine path termination</td>
</tr>
</tbody>
</table>
PATH2C

This COMMON block contains the parameters for each intermediate point along a source earth/skyshine ray to the sun. See Figure 5. For example, for each skyshine ray, if there are 3 different azimuth angles, and there are 10 intermediate points along each of the skyshine rays, there will be a total of 270 path dealt with in this COMMON block.

Common Block PATH2C used in:
RSHINE    SRCIRR

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSHLN(NZSMAX, MLMX2)</td>
<td>INTEGER</td>
<td>Number of points along each ray between each point along the points along a earth/skyshine path and the moon</td>
</tr>
<tr>
<td>ISHLN(ISTMAX)</td>
<td>INTEGER</td>
<td>Pointers to the altitude profile along each earth/skyshine-lunar path; since there are 4*32 = 128 possible earth/skyshine paths, and up to 200 points for each path, there 25,600 points; each point has a ray to the moon with up to 200 points each, so there can be up to 5.12 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.</td>
</tr>
</tbody>
</table>
PATH2C (continued)

- **DRSHLN** (ISTMAX)  REAL  Differential slant ranges (km) along each earth/skyshine-lunar path; since there are \(4 \times 32 = 128\) possible earth/skyshine paths, and up to 200 points for each path, there are 25,600 points; each point has a ray to the moon with up to 200 points each, so there can be up to 5.12 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.

- **SLNFAC** (MAXATM, ISTMA)  REAL  Interpolation factor for latitude variations in global atmosphere for each point along earth/skyshine-lunar path

- **NSLNFC** (2,2)  INTEGER  Limits of grid where geometry is valid
PATH2D

This COMMON block contains the parameters for each intermediate point along a source earth/skyshine ray to the moon. See Figure 5. For example, for each skyshine ray, if there are 3 different azimuth angles, and there are 10 intermediate points along each of the skyshine rays, there will be a total of 270 path dealt with in this COMMON block.

Common Block PATH2D used in:
RSHINE    SRCIRR

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDXSHL(NZSMAX, MLMX2)</td>
<td>INTEGER</td>
<td>Pointers to the starting position of each path</td>
</tr>
<tr>
<td>SCTNGL(NZSMAX, MLMX2)</td>
<td>REAL</td>
<td>Lunar scattering angle (deg) along earth/skyshine paths</td>
</tr>
<tr>
<td>XLEVSH(NZSMAX)</td>
<td>REAL</td>
<td>Lunar elevation angle (deg) at earth/skyshine path termination</td>
</tr>
</tbody>
</table>
PATH4

This COMMON block contains the celestial coordinates for the termination of each path.

Common Block PATH4 used in:
- CALCUL
- COUPLE
- PRCALC
- RSHINE
- SCNRIO
- SRCIRL

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XLGALT(NAZMAX)</td>
<td>REAL</td>
<td>Galactic azimuth (deg) of observer line-of-sight</td>
</tr>
<tr>
<td>BGALT(NAZMAX)</td>
<td>REAL</td>
<td>Galactic elevation (deg) of observer line-of-sight</td>
</tr>
<tr>
<td>XLECLT(NAZMAX)</td>
<td>REAL</td>
<td>Ecliptic azimuth (deg) of observer line-of-sight</td>
</tr>
<tr>
<td>BECLT(NAZMAX)</td>
<td>REAL</td>
<td>Ecliptic elevation (deg) of observer line-of-sight</td>
</tr>
<tr>
<td>XLGALS(NASMAX, NZSMAX)</td>
<td>REAL</td>
<td>Galactic azimuth (deg) of earth/skyshine line-of-sight</td>
</tr>
<tr>
<td>BGALS(NASMAX, NZSMAX)</td>
<td>REAL</td>
<td>Galactic elevation (deg) of earth/skyshine line-of-sight</td>
</tr>
<tr>
<td>XLECLS(NASMAX, NZSMAX)</td>
<td>REAL</td>
<td>Ecliptic azimuth (deg) of earth/skyshine line-of-sight</td>
</tr>
<tr>
<td>BECLS(NASMAX, NZSMAX)</td>
<td>REAL</td>
<td>Ecliptic elevation (deg) of earth/skyshine line-of-sight</td>
</tr>
<tr>
<td>XLGALC(MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Galactic azimuth for each atmosphere (deg)</td>
</tr>
<tr>
<td>BGALC(MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Galactic elevation for each atmosphere (deg)</td>
</tr>
<tr>
<td>XLECLC(MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Ecliptic azimuth for each atmosphere (deg)</td>
</tr>
<tr>
<td>BECLC(MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Ecliptic elevation for each atmosphere (deg)</td>
</tr>
</tbody>
</table>
PATH4 (continued)

FRSNWL(MAXLAT, MAXLON) REAL Fraction snow cover at each latitude and longitude
FRWTRL(MAXLAT, MAXLON) REAL Fraction water at each latitude and longitude
FRICEL(MAXLAT, MAXLON) REAL Fraction ice at each latitude and longitude
PATH5A

This COMMON block contains the parameters for the paths from each intermediate point along the observer-source-background path to the sun. There is one set of paths for each user-specified observer-source azimuth angle. For example, if there are 100 intermediate points along the observer-source-background path and there are 3 observer-source azimuth angles, the arrays in this COMMON block will deal with a total of 300 paths. See Figure 6.

Common Block PATH5A used in:

<table>
<thead>
<tr>
<th>CALCUL</th>
<th>DEFBCK</th>
<th>PRCALC</th>
<th>SCNRI0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Name</td>
<td>Type</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>NTBSL(NAZMAX, MLMX2)</td>
<td>INTEGER</td>
<td>Number of points along each observer-source-background/solar path</td>
<td></td>
</tr>
<tr>
<td>NDXSL(NAZMAX, MLMX2)</td>
<td>INTEGER</td>
<td>Pointers to the starting position of each path</td>
<td></td>
</tr>
<tr>
<td>SCTANG(NAZMAX, MLMX2)</td>
<td>REAL</td>
<td>Scattering angle (deg) to the sun at the initial point for each path</td>
<td></td>
</tr>
</tbody>
</table>
Figure 6. Observer-Source-Background Intermediate Point-to-Sun Paths. There is a set of paths as shown for each user-specified observer-source azimuth angle. COMMON Blocks: PATH 5A, 5B, 5C, 5D, 5E, 5F.
PATH5B

This COMMON block contains the parameters for the paths from each intermediate point along the observer-source-background path to the sun. There is one set of paths for each user-specified observer-source azimuth angle. For example, if there are 100 intermediate points along the observer-source-background path and there are 3 observer-source azimuth angles, the arrays in this COMMON block will deal with a total of 300 paths. See Figure 6.

Common Block PATH5B used in:
CALCUL    PRCALC    SCNRI

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITBSL(ISTMAX)</td>
<td>INTEGER</td>
<td>Pointers to the altitude profile along each observer-source-background/solar path; since there are NAZMAX possible azimuths, and up to MLMX2 points for each path, each point has a ray to the sun with up to MLMX2 points each, so there can be up to 0.32 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.</td>
</tr>
</tbody>
</table>
### PATH5B (continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOSBSL(ISTMAX)</td>
<td>REAL</td>
<td>Differential slant ranges (km) along each observer-source-background/solar path; since there are NAZMAX possible azimuths, and up to MLMX2 points for each path, and each point has a ray to the sun with up to MLMX2 points each, so there can be up to 0.32 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.</td>
</tr>
<tr>
<td>SLXFAC(MAXLAT, MAXLON, ISTMAX)</td>
<td>REAL</td>
<td>Interpolation factor for global atmosphere for each point along observer-source-background/solar path</td>
</tr>
<tr>
<td>NSLXFC(2,2)</td>
<td>INTEGER</td>
<td>Limits of grid where geometry is valid</td>
</tr>
</tbody>
</table>
PATH5C

This COMMON block contains the parameters for the paths from each intermediate point along the observer-source-background path to the moon. There is one set of paths for each user-specified observer-source azimuth angle. For example, if there are 100 intermediate points along the observer-source-background path and there are 3 observer-source azimuth angles, the arrays in this COMMON block will deal with a total of 300 paths. See Figure 6.

Common Block PATH5C used in:
  CALCUL    DEFBCK    PRCALC    SCNRIO

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTBLN(NAZMAX, MLMX2)</td>
<td>INTEGER</td>
<td>Number of points along each observer-source-background/moon path</td>
</tr>
<tr>
<td>NDXLN(NAZMAX, MLMX2)</td>
<td>INTEGER</td>
<td>Pointers to the starting position of each path</td>
</tr>
<tr>
<td>SCTNGX(NAZMAX, MLMX2)</td>
<td>REAL</td>
<td>Scattering angle (deg) to the moon at the initial point for each path</td>
</tr>
</tbody>
</table>


---

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PATH5D

This COMMON block contains the parameters for the paths from each intermediate point along the observer-source-background path to the moon. There is one set of paths for each user-specified observer-source azimuth angle. For example, if there are 100 intermediate points along the observer-source-background path and there are 3 observer-source azimuth angles, the arrays in this COMMON block will deal with a total of 300 paths. See Figure 6.

Common Block PATH5D used in:  
CALCUL   PRCALC   SCNRIO

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITBLN(ISTMAX)</td>
<td>INTEGER</td>
<td>Pointers to the altitude profile along each observer-source-background/lunar path; since there are NAZMAX possible azimuths, and up to MLMX2 points for each path, each point has a ray to the moon with up to MLMX2 points each, so there can be up to 0.32 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.</td>
</tr>
</tbody>
</table>
**PATH5D (continued)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOSBLN(ISTMAX)</td>
<td>REAL</td>
<td>Differential slant ranges (km) along each observer-source-background/lunar path; since there are NAZMAX possible azimuths, and up to MLMX2 points for each path, each point has a ray to the moon with up to MLMX2 points each, so there can be up to 0.32 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.</td>
</tr>
<tr>
<td>XLXFAX(MAXLAT, MAXLON,ISTMAX)</td>
<td>REAL</td>
<td>Interpolation factor for global atmosphere for each point along observer-source-background/lunar path</td>
</tr>
<tr>
<td>NXLXFC(2,2)</td>
<td>INTEGER</td>
<td>Limits of grid where geometry is valid</td>
</tr>
</tbody>
</table>
PATH6

This COMMON block contains the parameters for the sun-source-earth path. See Figure 7.

Common Block PATH6 used in:
CALCUL PRCALC SCNRIQ

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBSLR(MLMAX)</td>
<td>INTEGER</td>
<td>Number of points along sun-source-earth path</td>
</tr>
<tr>
<td>ITBSLR(MLMX2, MLMAX)</td>
<td>INTEGER</td>
<td>Pointer to altitude profile along sun-source-earth path</td>
</tr>
<tr>
<td>DRBSLR(MLMX2, MLMAX)</td>
<td>REAL</td>
<td>Differential slant ranges (km) along sun-source-earth path</td>
</tr>
<tr>
<td>SOLFAC(MAXLAT, MAXLON, MLMX2, MLMAX)</td>
<td>REAL</td>
<td>Interpolation factor for global atmosphere for each point along sun-observer-earth path</td>
</tr>
<tr>
<td>NSOLFC(2,2, MLMAX)</td>
<td>INTEGER</td>
<td>Limits of grid where geometry is valid</td>
</tr>
</tbody>
</table>
Figure 7. Sun-Source-Earth Path and Spectral Band Model Parameters for Vertical Earth-to-Space Path. COMMON Blocks: PATH6 PATH8.
**PATH8**

This COMMON block contains the parameters for the moon-source-earth path. See Figure 7.

Common Block PATH8 used in:
- CALCUL
- PRCALC
- SCNRI0

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBLNR(MLMAX)</td>
<td>INTEGER</td>
<td>Number of points along moon-source-earth path</td>
</tr>
<tr>
<td>ITBLNR(MLMX2, MLMAX)</td>
<td>INTEGER</td>
<td>Pointer to altitude profile along moon-source-earth path</td>
</tr>
<tr>
<td>DRBLNR(MLMX2, MLMAX)</td>
<td>REAL</td>
<td>Differential slant ranges (km) along moon-source-earth path</td>
</tr>
<tr>
<td>XLNFAC(MAXLAT, MAXLON, MLMX2, MLMAX)</td>
<td>REAL</td>
<td>Interpolation factor for global atmosphere for each point along moon-source-earth path</td>
</tr>
<tr>
<td>NLUNFC(2,2, MLMAX)</td>
<td>INTEGER</td>
<td>Limits of grid where geometry is valid</td>
</tr>
</tbody>
</table>
PERLUN

This COMMON block contains the Brown perturbation terms for the lunar longitude, latitude, and parallax.

Common Block PERLUN used in:
EPHEML    LUNPBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLPRLON</td>
<td>INTEGER</td>
<td>Number of longitude perturbation terms</td>
</tr>
<tr>
<td>PLON(50,5)</td>
<td>REAL</td>
<td>Longitude perturbations</td>
</tr>
<tr>
<td>NLAT</td>
<td>INTEGER</td>
<td>Number of latitude perturbation terms</td>
</tr>
<tr>
<td>PLAT(20,5)</td>
<td>REAL</td>
<td>Latitude perturbations</td>
</tr>
<tr>
<td>NPAR</td>
<td>INTEGER</td>
<td>Number of parallax perturbation terms</td>
</tr>
<tr>
<td>PPAR(20,5)</td>
<td>REAL</td>
<td>Parallax perturbations</td>
</tr>
</tbody>
</table>
PHFFOG

This COMMON block contains the phase functions for the advection and radiation LOWTRAN fog models.

Common Block PHFFOG used in:
    PHFGBD   PHFUNC

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWLFG</td>
<td>INTEGER</td>
<td>Number of wavelengths</td>
</tr>
<tr>
<td>WLFG(NWLAER)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>PHFOGS(2,NWLAER,</td>
<td>REAL</td>
<td>Phase function (sr⁻¹)</td>
</tr>
<tr>
<td>NANG)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHFGSY(2,NWLAER)</td>
<td>REAL</td>
<td>Asymmetry factor</td>
</tr>
</tbody>
</table>
PHFMAR

This COMMON block contains marine aerosol parameters.

Common Block PHFMAR used in:
    PHFUNC    PHMABD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWLMA</td>
<td>INTEGER</td>
<td>Number of wavelength points</td>
</tr>
<tr>
<td>WLMA(27)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>PHMARI(4,27,NANG)</td>
<td>REAL</td>
<td>Phase function</td>
</tr>
<tr>
<td>PHMASY(4,47)</td>
<td>REAL</td>
<td>Asymmetry parameter</td>
</tr>
</tbody>
</table>
PHFOCE

This COMMON block contains the single scattering phase functions for the Navy Oceanic Aerosol Model.

Common Block PHFOCE used in:
   PHFUNC    PHOCBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWLOC</td>
<td>INTEGER</td>
<td>Number of spectral points</td>
</tr>
<tr>
<td>WLOC(27)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>PHOCEA(4,27,NANG)</td>
<td>REAL</td>
<td>Phase functions</td>
</tr>
<tr>
<td>PHOCSY(4,27)</td>
<td>REAL</td>
<td>Asymmetry parameter</td>
</tr>
</tbody>
</table>
PHFRUR

This COMMON block contains the single scattering phase functions for the relative humidity dependent Urban Aerosol Model.

Common Block PHFRUR used in:

PHFUNC  PHRUBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWLRU</td>
<td>INTEGER</td>
<td>Number of spectral points</td>
</tr>
<tr>
<td>WLRU(27)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>PHRURL(4,27,NANG)</td>
<td>REAL</td>
<td>Phase functions</td>
</tr>
<tr>
<td>PHRUSY(4,27)</td>
<td>REAL</td>
<td>Asymmetry parameter</td>
</tr>
</tbody>
</table>
PHFSTR

This COMMON block contains the phase functions for the stratospheric and mesospheric aerosol models.

Common Block PHFSTR used in:
   PHFUNC   PHSTBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWLST</td>
<td>INTEGER</td>
<td>Number of wavelengths</td>
</tr>
<tr>
<td>WLST(27)</td>
<td>REAL</td>
<td>Wavelength (µm)</td>
</tr>
<tr>
<td>PHSTRA(4,27,NANG)</td>
<td>REAL</td>
<td>Phase function (sr⁻¹)</td>
</tr>
<tr>
<td>PHSTSY(4,27)</td>
<td>REAL</td>
<td>Asymmetry factor</td>
</tr>
</tbody>
</table>
PHFTRP

This COMMON block contains the phase functions for the relative humidity dependent tropospheric aerosol model.

Common Block PHFTRP used in:
   PHFUNC      PHTRBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWLTR</td>
<td>INTEGER</td>
<td>Number of wavelengths</td>
</tr>
<tr>
<td>WLTR(27)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>PHTROP(4,27,NANG)</td>
<td>REAL</td>
<td>Phase function (sr⁻¹)</td>
</tr>
<tr>
<td>PHTRSY(4,27)</td>
<td>REAL</td>
<td>Asymmetry factor</td>
</tr>
</tbody>
</table>
PHFURB

This COMMON block contains the single scattering phase functions for the relative humidity dependent Urban Aerosol Model.

Common Block PHFURB used in:
   PHFUNC    PHURBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWLUR</td>
<td>INTEGER</td>
<td>Number of spectral points</td>
</tr>
<tr>
<td>WLUR(27)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>PHURBN(4,27,NANG)</td>
<td>REAL</td>
<td>Phase functions</td>
</tr>
<tr>
<td>PHURSY(4,27)</td>
<td>REAL</td>
<td>Asymmetry parameter</td>
</tr>
</tbody>
</table>
PHHYDR

This COMMON block contains the phase functions for the cloud/fog models.

Common Block PHHYDR used in:

   PHHYBD   PHYDRO

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLC(NWCLLD)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>PHCLSY(15,4, NWCLLD)</td>
<td>REAL</td>
<td>Cloud asymmetry factor</td>
</tr>
<tr>
<td>RRTMP(7)</td>
<td>REAL</td>
<td>Marshall-Palmer rain rates (mm/hr)</td>
</tr>
<tr>
<td>PHRNSY(8,4, NWCLLD)</td>
<td>REAL</td>
<td>Rain asymmetry factor</td>
</tr>
<tr>
<td>TMPRN(4)</td>
<td>REAL</td>
<td>Rain temperatures (K)</td>
</tr>
<tr>
<td>TMPSN(4)</td>
<td>REAL</td>
<td>Snow temperatures (K)</td>
</tr>
</tbody>
</table>
PLMDAT

This COMMON block contains the band model parameters for the plume binary data file for use in the multiple line groups.

Common Block PLMDAT used in:
ENDPT EQUABS PLMSUB TANGPT

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLUMEF(NNNMAX, NGAS,MLMAX, MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Line strength partition function</td>
</tr>
<tr>
<td>PLUMEG(NGAS, MLMAX,MAXLAT, MAXLON)</td>
<td>REAL</td>
<td>Fine structure partition function</td>
</tr>
</tbody>
</table>
PLTPRM

This COMMON block contains various plotting parameters.

Common Block PLTPRM used in:
    PLTBD  PLTDRV  RDMSRT

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XAXL</td>
<td>REAL</td>
<td>Length of x-axis (inches) (7.0)</td>
</tr>
<tr>
<td>YAXL</td>
<td>REAL</td>
<td>Length of y-axis (inches) (4.0)</td>
</tr>
<tr>
<td>NMOLEC</td>
<td>INTEGER</td>
<td>Number of molecules</td>
</tr>
<tr>
<td>MOLID(NSMX)</td>
<td>INTEGER</td>
<td>Molecular index</td>
</tr>
<tr>
<td>NCURVE</td>
<td>INTEGER</td>
<td>Number of curve elements</td>
</tr>
</tbody>
</table>
PRBNDA

This COMMON block contains the spectral band model parameters for each molecule for each layer in the atmospheric profile array (vertical path). These band parameters are recalculated for each spectral bin.

Common Block PRBNDA used in:
BMOD BNDPAR INICPL KDISTR LOWTRN PLMSUB
PTHOSB PTHTAU

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD(ISMX,MLMAX,</td>
<td>REAL</td>
<td>S/d for each molecule for a given spectral maxlat,maxlon)</td>
</tr>
<tr>
<td>MAXLAT,MAXLON)</td>
<td></td>
<td>bin at each intermediate point in the atmospheric profile (amagat$^{-1}$ cm$^{-1}$)</td>
</tr>
<tr>
<td>OD(ISMX,MLMAX,</td>
<td>REAL</td>
<td>1/d for each molecule for a given spectral maxlat,maxlon)</td>
</tr>
<tr>
<td>MAXLAT,MAXLON)</td>
<td></td>
<td>bin at each intermediate point in the atmospheric profile (amagat$^{-1}$ cm$^{-1}$)</td>
</tr>
<tr>
<td>SC(ISMX,MLMAX,</td>
<td>REAL</td>
<td>Scattering coefficient (km$^{-1}$)</td>
</tr>
<tr>
<td>MAXLAT,MAXLON)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QA(ISMX)</td>
<td>REAL</td>
<td>Exponent for LOWTRAN double exponent band model</td>
</tr>
<tr>
<td>IBAND(ISMX)</td>
<td>INTEGER</td>
<td>Index for type of band model to be used for each molecule</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 - exponential</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 - Voight band model</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - Double exponent band model</td>
</tr>
<tr>
<td>ISPECS(NSPCMX)</td>
<td>INTEGER</td>
<td>Number of molecular species plus molecular scatter, aerosols, and hydrometeors</td>
</tr>
<tr>
<td>IMDATA(ISMX)</td>
<td>INTEGER</td>
<td>Switch set if molecular line strength greater than zero</td>
</tr>
</tbody>
</table>
### PRBNDB

This COMMON block contains the spectral band model parameters for each molecule for each layer in the atmospheric profile array (vertical path). These band parameters are recalculated for each spectral bin.

- Common Block PRBNDB used in:
  - BMOD
  - BNDDPAR
  - INICPL
  - KDISTR
  - LOWTRN
  - PLMSUB
  - PTHTAU

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL(ISMX,MLMAX, MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Molecular line width (cm⁻¹) at STP</td>
</tr>
<tr>
<td>AD(ISMX,MLMAX, MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Doppler line width (cm⁻¹) at STP</td>
</tr>
<tr>
<td>CD(ISMX,MLMAX, MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Continuum absorption coefficient (km⁻¹)</td>
</tr>
</tbody>
</table>
RAINTP

This COMMON block contains the parameters for the rain models. The size parameter has the following form:

\[
dN/dD = n0 \times \exp(-A \times D \times (\text{rate}^{*^B}))
\]

with drop diameter, D, in μm and the rate in mm/hr.

Common Block RAINTP used in:
RAINBD RAINEX RAINSP

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XN0(5)</td>
<td>REAL</td>
<td>n0</td>
</tr>
<tr>
<td>ARAIN(5)</td>
<td>REAL</td>
<td>A</td>
</tr>
<tr>
<td>BRAIN(5)</td>
<td>REAL</td>
<td>B</td>
</tr>
</tbody>
</table>
RAINWL

This COMMON block contains the spectral parameters for the rain models.

Common Block RAINWL used in:
RAINBD    RAINSP    SNOWSP

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLRN(NWLCLD)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>RNTMP(7)</td>
<td>REAL</td>
<td>Rain rate (mm/hr)</td>
</tr>
<tr>
<td>CAR(7,4,NWLCLD)</td>
<td>REAL</td>
<td>Rain normalized absorption coefficient</td>
</tr>
<tr>
<td>CXR(7,4,NWLCLD)</td>
<td>REAL</td>
<td>Rain normalized extinction coefficient</td>
</tr>
<tr>
<td>CSX(4,NWLCLD)</td>
<td>REAL</td>
<td>Snow normalized absorption coefficient</td>
</tr>
<tr>
<td>CSA(4,NWLCLD)</td>
<td>REAL</td>
<td>Snow normalized extinction coefficient</td>
</tr>
<tr>
<td>TEMPRN(4)</td>
<td>REAL</td>
<td>Rain parameter temperatures (K)</td>
</tr>
<tr>
<td>TEMPSN(4)</td>
<td>REAL</td>
<td>Snow parameter temperatures (K)</td>
</tr>
</tbody>
</table>
**RMODAT**

This COMMON block contains various parameters used in the plotting routines.

**Common Block RMODAT used in:**

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAVLNG(NUMPTS, NUMCRV)</td>
<td>REAL</td>
<td>Wavelength (μm) or wavenumber (cm⁻¹)</td>
</tr>
<tr>
<td>XMAX</td>
<td>REAL</td>
<td>Maximum spectral limit (μm or cm⁻¹)</td>
</tr>
<tr>
<td>XMIN</td>
<td>REAL</td>
<td>Minimum spectral limit (μm or cm⁻¹)</td>
</tr>
<tr>
<td>PATRAD(NUMPTS, NAZMAX, NUMCRV)</td>
<td>REAL</td>
<td>Path radiance (W/cm²/sr/μm or W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>ATMAX</td>
<td>REAL</td>
<td>Maximum value of both PATRAD and BKGRAD (W/cm²/sr/μm or W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>ATMIN</td>
<td>REAL</td>
<td>Minimum value of both PATRAD and BKGRAD (W/cm²/sr/μm or W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>PRYMAX(NAZMAX)</td>
<td>REAL</td>
<td>Maximum value of PATRAD (W/cm²/sr/μm or W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>BKGRAD(NUMPTS, NAZMAX, NUMCRV)</td>
<td>REAL</td>
<td>Background radiance (W/cm²/sr/μm or W/cm²/sr/cm⁻¹)</td>
</tr>
<tr>
<td>BRYMAX(NAZMAX)</td>
<td>REAL</td>
<td>Maximum value of BKGRAD (W/cm²/sr/μm)</td>
</tr>
<tr>
<td>TRAN(NUMPTS, NAZMAX, NUMCRV)</td>
<td>REAL</td>
<td>Transmission, forward in-scatter transmission, and scintillation with respect to the source</td>
</tr>
<tr>
<td>TRNMOL(NUMPTS,3, NAXMAX, NUMCRV, NSMX)</td>
<td>REAL</td>
<td>Molecular band, line wing, and total transmittance</td>
</tr>
</tbody>
</table>
RSTART

This COMMON block contains the switch and the local for a restarting of the calculations.

Common Block RSTART used in:
   BINFIL    CALCUL

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGEOMR</td>
<td>INTEGER</td>
<td>Geometry to restart</td>
</tr>
<tr>
<td>NVR</td>
<td>INTEGER</td>
<td>Spectral value to restart</td>
</tr>
<tr>
<td>NVS</td>
<td>INTEGER</td>
<td>Spectral bin to restart</td>
</tr>
<tr>
<td>LRSTRT</td>
<td>LOGICAL</td>
<td>Flag to restart or not</td>
</tr>
</tbody>
</table>
SCENES

This COMMON block contains the parameters to define the structured terrain scenes.

Common Block SCENES used in:

<table>
<thead>
<tr>
<th>ATMPRN</th>
<th>SCENBD</th>
<th>SETBCK</th>
<th>TERMPR</th>
<th>USRBCK</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSCENE</td>
<td>INTEGER</td>
<td>Number of scenes</td>
</tr>
<tr>
<td>SCENE(NSCEN, NMATL)</td>
<td>REAL</td>
<td>Fraction of each scene that consists of each material</td>
</tr>
<tr>
<td>CORLEN(NSCNE, NMATL)</td>
<td>REAL</td>
<td>Correlation length for each material (m)</td>
</tr>
<tr>
<td>PSDSLP(NSCNE, NMATL)</td>
<td>REAL</td>
<td>PSD slope of each material</td>
</tr>
<tr>
<td>STDEV(NSCNE, NMATL)</td>
<td>REAL</td>
<td>Log base 10 of the standard deviation relative to the mean for each material</td>
</tr>
<tr>
<td>RGCORL(NSCEN)</td>
<td>REAL</td>
<td>Roughness correlation length (m)</td>
</tr>
<tr>
<td>RGGSTDV(NSCEN)</td>
<td>REAL</td>
<td>Log base 10 of the roughness standard deviation relative to the mean</td>
</tr>
<tr>
<td>RGPWRL(NSCEN)</td>
<td>REAL</td>
<td>Roughness PSD slope</td>
</tr>
</tbody>
</table>
SHURUN

This COMMON block contains the parameters for the Schumann-Runge band parameters for molecular oxygen in the ultraviolet.

Common Block SHURUN used in:
- ABSO2
- O2UVBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSHO2(2)</td>
<td>REAL</td>
<td>Wavenumber limits (cm⁻¹)</td>
</tr>
<tr>
<td>DVSHO2</td>
<td>REAL</td>
<td>Increment (cm⁻¹)</td>
</tr>
<tr>
<td>SHNO2(424)</td>
<td>REAL</td>
<td>Logarithm (base 10) of absorption coefficient</td>
</tr>
</tbody>
</table>
SILEMS

This COMMON block contains the volumetric emissivity of zodiacal light.

Common Block SILEMS used in:
EMISSV    ZOD1BD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPTWL</td>
<td>INTEGER</td>
<td>Number of wavelength values</td>
</tr>
<tr>
<td>NDIST</td>
<td>INTEGER</td>
<td>Number of distance values</td>
</tr>
<tr>
<td>VOLMIS(291,33)</td>
<td>REAL</td>
<td>Volumetric emissivity of zodiacal light (W/cm²/sr/cm⁻¹)</td>
</tr>
</tbody>
</table>
SNWDAT

This COMMON block contains the parameters for the snow models.

Common Block SNWDAT used in:
   SNOWBD   SNOWEX

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASNW(6,3)</td>
<td>REAL</td>
<td>Polynomial coefficients for crystal velocity</td>
</tr>
<tr>
<td>BSNW(6,2)</td>
<td>REAL</td>
<td>Polynomial coefficients for crystal diameter</td>
</tr>
<tr>
<td>RHOWTR(56)</td>
<td>REAL</td>
<td>Water density (gm/cm³) as a function of temperature</td>
</tr>
<tr>
<td>RHOICE</td>
<td>REAL</td>
<td>Ice density (gm/m³)</td>
</tr>
</tbody>
</table>
SO2XS

This COMMON block contains the cross-sections of sulfur dioxide between 24,820 and 52,625 cm\(^{-1}\).

Common Block SO2XS used in:
- ABSSO2
- SO2BD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBEG</td>
<td>REAL</td>
<td>Initial wavenumber (cm(^{-1}))</td>
</tr>
<tr>
<td>VEND</td>
<td>REAL</td>
<td>Final wavenumber (cm(^{-1}))</td>
</tr>
<tr>
<td>VINCIR</td>
<td>REAL</td>
<td>Wavenumber increment (cm(^{-1}))</td>
</tr>
<tr>
<td>CRSSO2(NMAX)</td>
<td>REAL</td>
<td>Cross-section for sulfur dioxide (amagat(^{-1}) cm(^{-1}))</td>
</tr>
</tbody>
</table>
SOLIR1

This COMMON block contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 0 and 10,000 cm⁻¹.

Common Block SOLIR1 used in:

SLRCNT    SOLAR    SOLRBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLAR1(10000)</td>
<td>REAL</td>
<td>Solar irradiance (W/cm²/cm⁻¹)</td>
</tr>
<tr>
<td>SOLRCN</td>
<td>REAL</td>
<td>Solar constant (W/cm²)</td>
</tr>
</tbody>
</table>
SOLIR2

This COMMON block contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 10,001 and 20,000 cm\(^{-1}\).

Common Block SOLIR2 used in:

<table>
<thead>
<tr>
<th>SLRCNT</th>
<th>SOLAR</th>
<th>SOLRBD</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLAR2(10000)</td>
<td>REAL</td>
<td>Solar irradiance (W/cm(^2)/cm(^{-1}))</td>
</tr>
<tr>
<td>SOLRCN</td>
<td>REAL</td>
<td>Solar constant (W/cm(^2))</td>
</tr>
</tbody>
</table>
SOLIR3

This COMMON block contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 20,001 and 30,000 cm\(^{-1}\).

Common Block SOLIR3 used in:
  - SLRCNT  SOLAR  SOLRBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLAR3(10000)</td>
<td>REAL</td>
<td>Solar irradiance (W/cm(^2)/cm(^{-1}))</td>
</tr>
<tr>
<td>SOLRCN</td>
<td>REAL</td>
<td>Solar constant (W/cm(^2))</td>
</tr>
</tbody>
</table>
SOLIR4

This COMMON block contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 30,001 and 40,000 cm⁻¹.

Common Block SOLIR4 used in:
   SLRCNT   SOLAR   SOLRBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLAR4(10000)</td>
<td>REAL</td>
<td>Solar irradiance (W/cm²/cm⁻¹)</td>
</tr>
<tr>
<td>SOLRCN</td>
<td>REAL</td>
<td>Solar constant (W/cm²)</td>
</tr>
</tbody>
</table>
SOLIR5

This COMMON block contains the spectral irradiance of the sun at the earth for the mean earth-sun distance above 40,000 cm⁻¹.

Common Block SOLIR5 used in:
   SLRCNT   SOLAR   SOLRBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLAR5(10000)</td>
<td>REAL</td>
<td>Solar irradiance (W/cm²/cm⁻¹)</td>
</tr>
<tr>
<td>SOLRCN</td>
<td>REAL</td>
<td>Solar constant (W/cm²)</td>
</tr>
<tr>
<td>NPTSB</td>
<td>INTEGER</td>
<td>Number of spectral points for 50,001 - 57,420 cm⁻¹</td>
</tr>
<tr>
<td>DVB</td>
<td>REAL</td>
<td>Resolution (cm⁻¹)</td>
</tr>
<tr>
<td>SOLARB(760)</td>
<td>REAL</td>
<td>Solar irradiance (W/cm²/cm⁻¹)</td>
</tr>
</tbody>
</table>
STDMOL

This COMMON Block contain the molecular concentrations for the model atmospheres.

Common Block STDMOL used in:
    EQABS     STMLBD     USRDEF

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMOL(NL,24,7)</td>
<td>REAL</td>
<td>Molecular concentration profiles for each of the major molecular species for each model atmosphere (ppmv)</td>
</tr>
</tbody>
</table>
**SWPARAM**

This COMMON block contains various parameters used in the short wave broad band heat flux calculations taken from Lacis and Hansen.

Common Block SWPARAM used in:
- BRBNBD
- SOLBND

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK(3,8)</td>
<td>REAL</td>
<td>Unknown parameter</td>
</tr>
<tr>
<td>PSW(3,8)</td>
<td>REAL</td>
<td>Unknown parameter</td>
</tr>
<tr>
<td>BF(3)</td>
<td>REAL</td>
<td>Fraction of solar flux in each band</td>
</tr>
<tr>
<td>ALAM(3)</td>
<td>REAL</td>
<td>Wavelength (μm)</td>
</tr>
<tr>
<td>IKBAND(3)</td>
<td>INTEGER</td>
<td>Number of elements per band</td>
</tr>
</tbody>
</table>
**TMPOCN**

This COMMON block contains the ocean temperatures.

Common Block TMPOCN used in:
- OCNTBD
- SEATMP

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCNTMP(4,36,72)</td>
<td>REAL</td>
<td>Ocean temperatures (K)</td>
</tr>
<tr>
<td>POTEMP(3,36)</td>
<td>REAL</td>
<td>Average mean potential temperatures (°C)</td>
</tr>
</tbody>
</table>
TRACEG

This COMMON block contains the LOWTRAN band parameter for the trace gases.

Common Block TRACEG used in:
LOWTRN  TRACBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPNH3(431)</td>
<td>REAL</td>
<td>LOWTRAN band model parameters for ammonia</td>
</tr>
<tr>
<td>CPNO(62)</td>
<td>REAL</td>
<td>LOWTRAN band model parameters for nitric oxide</td>
</tr>
<tr>
<td>CPNO2(142)</td>
<td>REAL</td>
<td>LOWTRAN band model parameters for hydrogen dioxide</td>
</tr>
<tr>
<td>CPSO2(226)</td>
<td>REAL</td>
<td>LOWTRAN band model parameters for sulfur dioxide</td>
</tr>
</tbody>
</table>
**TRANSP**

This COMMON block contains the transmission for each molecular species, aerosol, and hydrometeor.

Common Block TRANSP used in:
- PRCALC
- TRNSMT

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPCTR(NISMX,3, NAZMAX)</td>
<td>REAL</td>
<td>Transmission for each of the atmospheric components</td>
</tr>
</tbody>
</table>
UFMIX

This COMMON block contains the LOWTRAN band parameters for the uniformly mixed gases.

Common Block UFMIX used in:
LOWTRN    UMIXBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPCO(173)</td>
<td>REAL</td>
<td>LOWTRAN band model parameters for carbon monoxide</td>
</tr>
<tr>
<td>CPCH4(493)</td>
<td>REAL</td>
<td>LOWTRAN band model parameters for methane</td>
</tr>
<tr>
<td>CPN20(704)</td>
<td>REAL</td>
<td>LOWTRAN band model parameters for nitrous oxide</td>
</tr>
<tr>
<td>CPO2(382)</td>
<td>REAL</td>
<td>LOWTRAN band model parameters for oxygen</td>
</tr>
</tbody>
</table>
UFTAPE

This COMMON block contains the parameters required to read the MODTRAN band model tape, UFTAPE.

Common Block UFTAPE used in:
  ABSMOL   UFTPBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBLOCK</td>
<td>INTEGER</td>
<td>Number of blocks of data on UFTAPE</td>
</tr>
<tr>
<td>IFREQ(273)</td>
<td>INTEGER</td>
<td>Initial frequency for each block of data on UFTAPE</td>
</tr>
<tr>
<td>IPARAM(273)</td>
<td>INTEGER</td>
<td>Number of spectral data sets in each block of data on UFTAPE</td>
</tr>
</tbody>
</table>
UPRATM

This COMMON block contains the parameters for the upper model atmosphere profiles (i.e., above 120 km).

Common Block UPRATM used in:
- EQABS
- EXOATM
- SETALT
- UPPRBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZU(NLUPR)</td>
<td>REAL</td>
<td>Altitude (km)</td>
</tr>
<tr>
<td>TSTD(NLUPR)</td>
<td>REAL</td>
<td>Standard temperature (K)</td>
</tr>
<tr>
<td>PSTD(NLUPR)</td>
<td>REAL</td>
<td>Standard pressure (mb)</td>
</tr>
<tr>
<td>TUS(NTEXO, NLUPR,3)</td>
<td>REAL</td>
<td>Seasonal temperatures (K) for a given exoatmospheric temperature</td>
</tr>
<tr>
<td>PUS(NTEXO, NLUPR,3)</td>
<td>REAL</td>
<td>Seasonal pressures (mb) for a given exoatmospheric pressure</td>
</tr>
<tr>
<td>TMPEXO(NTEXO)</td>
<td>REAL</td>
<td>Exoatmospheric temperatures (K) for TUS and PUS</td>
</tr>
<tr>
<td>TUX(NLUPR, MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Final temperatures (K) for upper atmosphere</td>
</tr>
<tr>
<td>PUX(NLUPR, MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Final pressures (mb) for upper atmosphere</td>
</tr>
</tbody>
</table>
USERDF

This COMMON block contains the parameters for the user-defined atmosphere model.

Common Block USERDF used in:

<table>
<thead>
<tr>
<th>ASPECT</th>
<th>DEFAULT</th>
<th>EQABS</th>
<th>GETASP</th>
<th>HAZE</th>
<th>ISTAER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETALT</td>
<td>STRCN2</td>
<td>USRDEF</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLUSER</td>
<td>INTEGER</td>
<td>Number of altitudes</td>
</tr>
<tr>
<td>ZUSER(MLMAX)</td>
<td>REAL</td>
<td>Altitude (km)</td>
</tr>
<tr>
<td>INDXH</td>
<td>INTEGER</td>
<td>Index for user-defined haze profile</td>
</tr>
<tr>
<td>HZUSER(MLMAX)</td>
<td>REAL</td>
<td>User-defined haze profile (km⁻¹)</td>
</tr>
<tr>
<td>INDXC</td>
<td>INTEGER</td>
<td>Index for user-defined structure constant profile</td>
</tr>
<tr>
<td>CN2USR(MLMAX)</td>
<td>REAL</td>
<td>User-defined structure constant profile (m⁻²/³)</td>
</tr>
<tr>
<td>INDXA</td>
<td>INTEGER</td>
<td>Index for user-defined aerosol profile</td>
</tr>
<tr>
<td>IARUSR(MLMAX)</td>
<td>INTEGER</td>
<td>User-defined aerosol profile</td>
</tr>
<tr>
<td>NASUSR</td>
<td>INTEGER</td>
<td>Number of user-defined earth/skyshine elevation angles</td>
</tr>
<tr>
<td>ASPUSR(NASMAX)</td>
<td>REAL</td>
<td>User-defined earth/skyshine elevation angles (deg)</td>
</tr>
<tr>
<td>MPUSR</td>
<td>INTEGER</td>
<td>Index for user-defined pressure</td>
</tr>
<tr>
<td>PUSER(MLMAX)</td>
<td>REAL</td>
<td>User-defined pressure (mb)</td>
</tr>
<tr>
<td>MTUSR</td>
<td>INTEGER</td>
<td>Index for user-defined temperature</td>
</tr>
<tr>
<td>TUSER(MLMAX)</td>
<td>REAL</td>
<td>User-defined temperature (K)</td>
</tr>
<tr>
<td>MCUSR(ISMX)</td>
<td>INTEGER</td>
<td>Indices for user-defined molecular concentrations</td>
</tr>
<tr>
<td>AUSER(MLMAX, ISMX)</td>
<td>REAL</td>
<td>User-defined molecular concentrations (ppmv)</td>
</tr>
<tr>
<td>FLUSR</td>
<td>LOGICAL</td>
<td>Flag for completing profile with model atmosphere</td>
</tr>
</tbody>
</table>
**USERNM**

This COMMON block contains the user-defined atmosphere name.

Common Block USERNM used in:

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>USRDEF</td>
<td>BBTEMP</td>
<td>SUMFIL</td>
<td>VISUAL</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMODEL</td>
<td>CHARACTER*40</td>
<td>User-defined atmosphere name</td>
</tr>
</tbody>
</table>
### VSADTA

This COMMON block contains the parameters for the vertical structure profile of the aerosol density between 0 and 2 km above ground level.

Common Block VSADTA used in:

<table>
<thead>
<tr>
<th>ENDPT</th>
<th>EQABS</th>
<th>EQUABS</th>
<th>INITL</th>
<th>TANGPT</th>
<th>VSA</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMAX</td>
<td>REAL</td>
<td>Maximum altitude (km) at which vertical structure profile will be calculated. Default value is 2 km, unless unless cloud/fog top is lower.</td>
</tr>
<tr>
<td>ZVSA(NVSA, MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Altitude (km)</td>
</tr>
<tr>
<td>RHVSA(NVSA, MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Relative humidity</td>
</tr>
<tr>
<td>HZVSA(NVSA, MAXLAT,MAXLON)</td>
<td>REAL</td>
<td>Extinction coefficient (km$^{-1}$) at 0.55 μm</td>
</tr>
</tbody>
</table>
WETNES

This COMMON block contains the volumetric moisture for vegetation and soil.

Common Block WETNES used in:
   DIREMS    EMISBD

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV(13)</td>
<td>REAL</td>
<td>Volumetric moisture on vegetation and soil</td>
</tr>
</tbody>
</table>
WNLOHI

This COMMON block contains the spectral LOWTRAN band model coefficients.

Common Block WNLOHI used in:
LOWTRTN   WVBND

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Type</th>
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WNLOHI (continued)

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<td>CSSO2(4)</td>
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ZODBND

This COMMON block contains the zodiacal light parameters.

Common Block ZODBND used in:
    DBANDS    ZOD2BD

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<td>Number of points in each band</td>
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<td>Temperature of dust (K)</td>
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<tr>
<td>OMEGA(3)</td>
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<td></td>
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<td>DEL(3)</td>
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<td>Q(3)</td>
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<td>EOS(632)</td>
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ZPLANE

This COMMON block contains the zodiacal symmetry plane parameters.

Common Block ZPLANE used in:
  ZOD2BD    ZODICL

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<td>ZNODE</td>
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<td>Ascending node (deg)</td>
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<td>ZINC</td>
<td>REAL</td>
<td>Inclination (deg)</td>
</tr>
<tr>
<td>ZN</td>
<td>REAL</td>
<td>Normalized dust density at 1 AU</td>
</tr>
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<td></td>
<td></td>
<td>(particles/m^3)</td>
</tr>
<tr>
<td>ZALPHA</td>
<td>REAL</td>
<td>Radial dependence factor</td>
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6.0 PARAMETER DATA DICTIONARY

The description and value of each PARAMETER variable, in addition to the modules in which it is contained, are presented in Table 1. All PARAMETER variables are declared INTEGER.

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<th>PARAMETER</th>
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<tr>
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<td>Number of different band molecules whose band model parameters can be read in</td>
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<td>ISMX</td>
<td>MOLMAX+8</td>
<td>Number of species used in calculations</td>
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<td>30000</td>
<td>Maximum size of a COMMON block for raypath parameters</td>
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<td>MLMAX</td>
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<td>Maximum number of altitude points</td>
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<tr>
<td>MLMX2</td>
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<td>Maximum number of points for a ray</td>
</tr>
<tr>
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<td>Maximum number of earth/skyshine aspect angles</td>
</tr>
<tr>
<td>NAZMAX</td>
<td>30</td>
<td>Maximum number of observer-source azimuths</td>
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<tr>
<td>NBAND</td>
<td>16</td>
<td>Maximum number of elements in exponential sum expansion for multiple scattering</td>
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<tr>
<td>NFRQ</td>
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<td>Number of frequency values in microwave water refractivity data base</td>
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<tr>
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<td>Number of molecules in plume binary data file</td>
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<tr>
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<td>Maximum number of geometries</td>
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<td>Number of line groups used for SIRRM calculations</td>
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<tr>
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<td>Maximum number of background scenes</td>
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Table 1. PARAMETER Variables (continued).

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<tr>
<td>NWLWTR</td>
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<td>Number of spectral water refractivity data base</td>
</tr>
<tr>
<td>NXMIE</td>
<td>101</td>
<td>Maximum number of bins for particle size distribution for Mie calculations</td>
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<tr>
<td>NZSMAX</td>
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<td>Maximum number of earth/skyshine azimuth angles</td>
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<td>NXMAX</td>
<td>100</td>
<td>Maximum number of extra altitudes</td>
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<td>Maximum number of antecedent temporal points</td>
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<td>Number of altitude points for Vertical Structure Algorithm</td>
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<td>Number of spectral points for hydrometeors</td>
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<tr>
<td>NWLAER</td>
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<td>Number of spectral points for aerosols</td>
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<td>NANG</td>
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<tr>
<td>NL</td>
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<td>Number of altitude layers in model atmospheres</td>
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<td>NLUPR</td>
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<td>Number of altitude layers in upper atmosphere profiles</td>
</tr>
<tr>
<td>NTEXO</td>
<td>11</td>
<td>Number of exospheric temperature profiles</td>
</tr>
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<td>Maximum number of latitudes used for global atmosphere</td>
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<tr>
<td>MAXLON</td>
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<td>Maximum number of longitudes used for global atmosphere</td>
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<td>DESCRIPTION</td>
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<td>Number of altitudes in the troposphere haze profiles</td>
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<tr>
<td>NZSTRA</td>
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<td>Number of molecular species that MOSART recognizes</td>
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<td>MLIDMX+8</td>
<td>Number of species that MOSART recognizes</td>
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<td>Maximum number of spectral points used in slit function convolutions</td>
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<tr>
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7.0 CALLING STRUCTURE

The calling structure (i.e., which routine calls which other routines and which routines are called by a routine) is provided below, together with the prerequisite calling order of each program, and the COMMON block reference list.

7.1 MOSART

7.1.1 MOSART Subprogram References

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VIRIAL calls:
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DENWTR calls: none
SPHAIR calls: none
SPHICE calls:
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SPHWTR calls:
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THCAIR calls: none
THCICE calls:
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THCWTR calls:
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INDEXBK calls:
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SOLRAD       TERMPR XPNDAR ZROINT
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### 7.1.2 MOSART Cross-Reference List

- ABCCL4 called by: BMOD
- ABHNO4 called by: BMOD
- ABN205 called by: BMOD
- ABSCFC called by: BMOD
- ABSCLO called by: BMOD
- ABSH20 called by: BMOD
- ABSMOL called by: BMOD
- ABSN2 called by: BMOD
- ABSN2O called by: BMOD
- ABSNO2 called by: BMOD
- ABSO2 called by: BMOD

505
ABSO3 called by: BMOD
ABSSO2 called by: BMOD
ADD called by: CNSTNT
AECALC called by: BRNDR
AERSOL called by: ENDPT
AH2O2 called by: BMOD
AIRTMP called by: BRNDR
AMMNIA called by: BMOD
AMOLSC called by: BNDPAR
ARGABD called by: AERSOL
ARSLBD called by: AERSOL
ARSXBD called by: AERSOL
ASPECT called by: SRCIRL
ATMPRN called by: PRCALC
ATMSBD called by: ATMPRN
BAND called by: TRNSMT
BBARSL called by: BRNDR
BB03 called by: SOLBND
BCKCHK called by: DEPBCK
BCKGND called by: COUPLE
BCKPRN called by: PRCALC
BDRF called by: BCKGND
BEAUFT called by: INITL
BETA called by: CLDLRYR
BETAU called by: CLDLRYR
BINFIL called by: INITL
BKGDBD called by: ATMPRN
BKSTBD called by: AERSOL
BMOD called by: BNDPAR
BNDXLG called by: EQABS

EQUABS  TANQPT

HYDROM  MARINE
BBARSL  BNDPAR  HYDROM  MARINE  PHFUNC
PHYDRO  PRCALC  RSHINE
BNDPAR  HYDROM  MARINE
SRCIRL
PLRPRN  GBLBCK  INITL  PRCALC  SCNRI0  USRDEF
SHNGEO  SRCGEO  SRCIRL

ETALT

506
BNDPAR called by:
PRCALC
BNTPTH called by:
PRCALC
BRBNBD called by:
CLDLRY
BRBNDR called by:
MOSART
CALCUL called by:
PTHTAU
CHALEND called by:
GETPOS
CFCBD called by:
ABSCFC
CHANGE called by:
EQUABS
CHKRST called by:
BINFIL
CHKVER called by:
BINFIL
CHRCBD called by:
ATMPRN
CHTIME called by:
GETPOS
CIREX called by:
HYDROM
CIRRB called by:
PHYSUO
CIRRUSS called by:
INITL
CITIES called by:
RDSCN
CLDALT called by:
EQUABS
CLDLRY called by:
SOLBND
CLDRBD called by:
RDNPT
ENDT
USRCLD
CNSTNT called by:
MOSART
COAT called by:
MIEPHS
COMFNC called by:
PLMSNB
CONFIG called by:
MOSART
COUPLE called by:
PRCALC
CROSBD called by:
ABCCL4
CSPPF called by:
PHFUNC
DADD called by:
CNSTNT
DBANDS called by:
ZODICL
DBINIT called by:
MOSART
DDIF called by:
SWAT
DDIV called by:
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DEFALT called by:
INITL
EQUABS
HYDROM
PUTCLD
RAINSP
TANGPT
ABHNO4
ABN2O5
ABSCLO
PHYDRO
DEFBCK called by:
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DEMSXX called by:
  BCKGND
DENAIR called by:
  SPLYR
DENWTR called by:
  SPLYR
DEPOLL called by:
  AMOLSC  PHMLSC
DERF called by:
  BAND  SHADOW
DESAER called by:
  AERSOL
DEVCBD called by:
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ECOSBD called by:
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EHBSLO called by:
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ESFIT called by: INICPL
EVAPOR called by: SRFLUX
EVEN called by: BMOD  SOLAR
EXGALS called by: BCKGND
XMLBD called by: EQABS  USRDEF
EXOATM called by: DEFLT  INITL
EXOTMP called by: INITL
FDATE called by: TITLCR
FILOPN called by: INITL
FILRT called by: INITL
FILTER called by: PRCALC
FLSTAT called by: BINFIL
FLUXLW called by: BRBNDR
PRESNL called by: BCKGND  DIREMS
GALRAD called by: BCKGND
GAM called by: SWAT
GAMMLN called by: DNDR
GBLBCX called by: DEFLT  USRDEF
GEM called by: SCNRI0  INDXBK  INITL  SLPOS  SRCGEO
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SETPLG called by:       CALCUL
SETUP called by:        DEFBCB
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SHNGEO called by:       SCNRIO
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SKYNOI called by:       EQUABS
SLPOS called by:        EPHEMS
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SLR2BD called by:       SOLAR
SLR3BD called by:       SOLAR
SLR4BD called by:       SOLAR
SLR5BD called by:       SOLAR
SLRCNT called by:       BRBNDR
SLUNAR called by:       BCKGND
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SNOWEX called by:       PRCALC
SNOWSP called by:       PRCALC
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SOIL called by:         DBANDS
SOL called by:          EMISSV
SOLBDN called by:       PRCALC
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  GETBCK
USRCLD called by:
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  INITL
VIRIAL called by:
  DENAIR
VIRLBD called by:
  VIRIAL
VISRH called by:
  EQUABS
VSA called by:
  INITL
WTRBD called by:
  INDEXW
XMCONV called by:
  USRDEF
XPNDA called by:
  PRCALC
XTERP called by:
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  CHANGE  COUPLE  DEPOL  ENDFE  EQABS  EQUABS
  EVAPOR  EXGALS  EXOATM  FILTER  HAZE  HYDROM
  INDEXL  INDEXW  NXXPAU  PHYDRO  PRINS  SCIINTL
  SETALT  SLUNAR  SOLRAD  SPHICE  SPHWTR  STRCN2
  TANGPT  THCICE  THCWTR  USRDEF  VIRIAL  XMCONV
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7.1.3 MOSART Pre-Requisite Order List

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### 7.2 ASCBIN

#### 7.2.1 ASCBIN Subprogram References

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7.2.2 ASCBIN Cross-Reference List

ADD called by:
   CNSTNT
ASCBIN not called
CNSTNT called by:
   ASCBIN
CONFIG called by:
   ASCBIN
CONVAB called by:
   ASCBIN
DADD called by:
   CNSTNT
DDIV called by:
   CNSTNT
DEVCEBD called by:
   ASCBIN
   FILRT
   RDPLTR
DIV called by:
   CNSTNT
DMUL called by:
   CNSTNT
DSUB called by:
   CNSTNT
FILRT called by:
   ASCBIN
FILTER called by:
   TABLEA
   TABLEB
   TABLET
GERROR called by:
   IOERR
GETHDR called by:
   TABLEA
   TABLEB
   TABLEH
   TABLET
GETVAR called by:
   RDFLTR
IBNSRC called by:
   XTERP
INFLED called by:
   RDFLTR
IOERR called by:
   ASCBIN
   SETFIL
   TABLEA
   TABLEB
   TABLET
   GETHDR
   GETVAR
   RDFLTR
   RDLINE
LCTRIM called by:
   FILRT
LENSTR called by:
   PARSE
   RDFLTR
   RDLINE
LWCASE called by:
   RDFLTR
MOLNBD called by:
   TABLET
MUL called by:
   CNSTNT
PARSE called by:
   RDFLTR
   TABLEA
   TABLEB
   TABLEH
   TABLET
PROMPT called by:
   ASCBIN
RDPLTR called by:
   TABLEA
   TABLEB
   RDFLTR
   RDLINE
SETFIL called by:
   ASCBIN
   CONVAB
7.2.3 **ASCBIN Pre-Requisite Order List**

<table>
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7.2.4 **ASCBIN Common Block Cross-Reference List**

Common Block DEVCMN used in:
- ASCBIN        DEVCBD
- FILRT

Common Block DEVICE used in:
- ASCBIN        DEVCBD
- RDFLTR

Common Block CONST used in:
- CNSTNT        FILTER
- XTERP

Common Block FLTRDT used in:
- FILTER        RDFLTR

Common Block HEADER used in:
- GETHDR        TABLEE
- TABLEB        TABLEH
- TABLET

Common Block INFLTR used in:
- INFBD         RDFLTR

Common Block MOLNMX used in:
- MOLNBD        TABLET

Common Block MACHIN used in:
- DEVCBD

7.3 **BBTEMP**

7.3.1 **BBTEMP Subprogram References**

BBTEMP calls:
- CNSTNT
- IOERR

CNSTNT calls:
- ADD
- MUL

ADD calls: none
DADD calls: none
DDIV calls: none
DIV calls: none
DMUL calls: none
DSUB calls: none
MUL calls: none
SUB calls: none
CONFIG calls: none
FILRT calls:
  LCTRIM
LCTRIM calls: none
FILTER calls:
  XTERP
XTERP calls:
  IBNSRC
IBNSRC calls: none
GETHDR calls:
  IOERR
IOERR calls:
  GERROR
GERROR calls: none
INVPLK calls: none
PROMPT calls: none
RDPLTR calls:
  GETVAR  IOERR  LCTRIM  LENSTR  LWCASE  PARSE
  RDLNE  UPCASE
GETVAR calls:
  IOERR
LENSTR calls: none
LWCASE calls: none
PARSE calls:
  LCTRIM  LENSTR
RDLNE calls:
  IOERR  LCTRIM  LENSTR
UPCASE calls: none
SETFIG calls: none
SUMFIL calls:
  CHTIME  IOERR  LENSTR  PUTCLD  PUTSLR
CHTIME calls: none
PUTCLD calls:
  IOERR
PUTSLR calls:
  IOERR  SLRCNT
SLRCNT calls: none

7.3.2 BBTEMP Cross-Reference List

ADD called by:
  CNSTNT
BBTEMP not called
CHRCEBD called by:
  PUTCLD  SUMFIL
CHTIME called by:
  SUMFIL
CLDRBD called by:
  PUTCLD
CNSTNT called by:
  BBTEMP
CONFIG called by:
  BBTEMP
DADD called by:
  CNSTNT
DDIV called by:
  CNSTNT
DEVCEBD called by:
  BBTEMP
DIV called by:
  CNSTNT
DMUL called by:
  CNSTNT
  FILRT  PUTCLD  PUTSLR  RDPLTR  SUMFIL

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DSUB called by:  
  CNSTNT
FILRT called by:  
  BBTEMP
FILTER called by:  
  BBTEMP
GERRORE called by:  
  IOERR
GETHDR called by:  
  BBTEMP
GETVAR called by:  
  RDFLTR
IBNSRC called by:  
  XTERP
INFLBD called by:  
  RDFLTR
INVPLK called by:  
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IOERR called by:  
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  RDFLTR
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  RDFLTR
MUL called by:  
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PARSE called by:  
  RDFLTR
PROMPT called by:  
  BBTEMP
PUTCLD called by:  
  SUMFIL
PUTSLR called by:  
  SUMFIL
RDFLTR called by:  
  BBTEMP
RDLNE called by:  
  RDFLTR
SETFLG called by:  
  BBTEMP
SLR1BD called by:  
  SLRCNT
SLRCNT called by:  
  PUTSLR
SUB called by:  
  CNSTNT
SUMFIL called by:  
  BBTEMP
UPCASE called by:  
  RDFLTR
XTERP called by:  
  FILTER

7.3.3 BBTEMP Pre-Requisite Order List

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### 7.4 CRFILE

#### 7.4.1 CRFILE Subprogram References

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EPHTIM calls: none
MDRI calls:
  AFTERP
  OHCALC
AFTERP calls: none
OHCALC calls: none
SOLZEN calls:
  LATPHI
  SUBSOL
LATPHI calls: none
SUBSOL calls: none
DNO calls:
  SINTRP
SINTRP calls: none
DREAD calls: none
GTD6 calls:
  DENS
  GLATF
  GLOBES
  GTS6
  VTST
DENS calls:
  SPLINE
SPLINE calls: none
SPLINE calls: none
SPLINT calls: none
GLATF calls: none
GLOBES calls: none
GTS6 calls:
  CCOR
CCOR calls: none
CCOR calls: none
DENS calls:
  SPLINE
SPLINE calls: none
SPLINT calls: none
GLOBE6 calls:
  TSELEC
TSELEC calls: none
VTST calls: none
INTERP calls: none
OHCALC calls: none
POZONE calls: none
SUN calls:
  DECEQT
DECEQT calls: none
TDEP calls: none
V1 calls: none
MENU calls:
  IOERR
  PROMPT
MONTH calls:
  LCTRIM
CRUAER calls:
  IOERR
CRUCLD calls:
  IOERR
FILRT calls:
  LCTRIM
RDMDTN calls:
  CNVJTK
CNVJTK calls:
  IOERR

7.4.2 CRFILE Cross-Reference List

AFTERP called by:
  MDRI

528
CALEND called by: CRINPT
CCOR called by: GTS6
CHRCBD called by: MENU
CHTIME called by: CRINPT
CNVJTK called by: CRUATM
CONFIG called by: RMDTN
CRFILE called by: CRFILE
CRBKGD called by: CRFILE
CRFILE not called
CRFTR called by: CRFILE
CRINPT called by: CRFILE
CRUAER called by: CRFILE
CRUAATM called by: CRFILE
CRUCRD called by: CRFILE
DECEQT called by: SUN
DENSM called by: GTD6
DENSU called by: GTS6
DEVCEBD called by: CRBKGD
CRUCLD called by: CRFILE
DNCLCAL called by: MDRI
DNET called by: GTS6
DNO called by: MDRI
DREAD called by: MDRI
EPHTIM called by: MDRI
FILRT called by: MSAG
GETVAR called by: CRFILE
GERROR called by: IOERR
GNET called by: CRINPT
GUT called by: CRUATM
GLOB6S called by: GTD6
GLOBE6 called by: GTS6
GTD6 called by: MDRI
GTD6BK called by: GTD6
GTS6 called by: GTD6
IGTINT called by: CRINPT

CRUATM  MSAG
INARBD called by:
  CRUAER
INBKBD called by:
  CRBKGD
INCLBD called by:
  CRUCLD
INFLBD called by:
  CRFLTR
INPTBD called by:
  CRINPT
INTERP called by:
  MDRI
IOERR called by:
  CRNVTX
  CRBKGD
  CRFILE
  CRFLTR
  CRINPT
  CRUAER
  RDMDTN
LATPHI called by:
  SOLZEN
LCTRIM called by:
  CRFLTR
LENSTR called by:
  CRFLTR
LWCASE called by:
  CRINPT
MDRI called by:
  CRUAER
  MSAG
  CRFILE
  CRINPT
  CRINPT
  CRINPT
MENU called by:
  CRFILE
  CRINPT
MONTH called by:
  CRINPT
MSAG called by:
  CRUAER
NRLBD called by:
  DREAD
OHCALC called by:
  MDRI
POZONE called by:
  MDRI
PROMPT called by:
  CRFILE
RDMDTN called by:
  CRFILE
SINTRP called by:
  DNO
SOLZEN called by:
  DNCALC
SPLINE called by:
  DENSM
  DENSU
SPLINI called by:
  DENSM
  DENSU
SPLINT called by:
  DENSM
  DENSU
SUBSOL called by:
  SOLZEN
SUN called by:
  MDRI
TDEP called by:
  MDRI
TSELEC called by:
  GLOBE6
UPCASE called by:
  CRFLTR
VP called by:
  MDRI
VTST called by:
  GTD6
  GTS6

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### 7.4.3 CRFILE Pre-Requisite Order List

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### 7.4.4 CRFILE Common Block Cross-Reference List

- **Common Block DEVICE** used in: CRFILE, DEVCBD
- **Common Block INBKGD** used in: CRBKGD, INBKGD
- **Common Block MACHIN** used in: CRBKGD, CRFLTR, DEVCBD
- **Common Block INFLTR** used in: CRFLTR, INFLBD
- **Common Block HEADER** used in: CRINPT, CRUATM
- **Common Block INPNDX** used in: CRINPT, CRUATM
- **Common Block INPTDT** used in: CRINPT, CRUATM
- **Common Block INUAER** used in: CRUAER, INARBD
- **Common Block INUCLD** used in: CRUCLD, INCLBD
- **Common Block PARMB** used in: DENSM, DENSU
- **Common Block DBASE** used in: DREAD, INTERP
- **Common Block NRLDEV** used in: DREAD, NLRBD
- **Common Block LPOLY** used in: GLOBE6S, GLOBE6
- **Common Block CSW** used in: GLOBE6S, GLOBE6
- **Common Block GTS3C** used in: GTD6, GT56
- **Common Block MESO6** used in: GTD6, GTS6
- **Common Block LOWER6** used in: GTD6, GTS6
- **Common Block PARM6** used in: GTD6, GTD6BK
- **Common Block MAVG6** used in: GTD6, GTD6BK
- **Common Block DMIX** used in: GTD6, GTD6BK
- **Common Block METSEL** used in: GTD6, GTD6BK
- **Common Block DEVCMN** used in: FILRT, MDRI
- **Common Block NRLFIL** used in: MDRI, NLRBD

GTD6  GTS6  TSELEC  VTST

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Common Block SPECIE used in:
   MDRI   NRLBD
Common Block CHRCNM used in:
   CHRCBD   MENU

7.5 FACET

7.5.1 FACET Subprogram References

FACET calls:
   CNSTNT   CONFIG   FILTER   GETHDR   GETVAR   GETVEC
   IOERR    LWCASE   PARSE   PROMPT   RDFLTR   RDLINE
   SETFLG   SUMFIL   SURFAC   UPCASE   XTERP

CNSTNT calls:
   ADD       DADD     DDIV     DIV      DMUL     DSUB
   MUL       SUB

ADD calls: none
DADD calls: none
DDIV calls: none
DIV calls: none
DMUL calls: none
DSUB calls: none
MUL calls: none
SUB calls: none
CONFIG calls: none
FILTER calls:
   XTERP
XTERP calls:
   IBNSRC
IBNSRC calls: none
GETHDR calls:
   IOERR
IOERR calls:
   GERROR
GERROR calls: none
GETVAR calls:
   IOERR
GETVEC calls:
   IOERR
   LCTRIM     LENSTR
LCTRIM calls: none
LENSTR calls: none
LWCASE calls: none
PARSE calls:
   LCTRIM     LENSTR
PROMPT calls: none
RDFLTR calls:
   GETVAR   IOERR   LCTRIM   LENSTR   LWCASE   PARSE
   RDLINE
RDLINE calls:
   IOERR   LCTRIM   LENSTR
UPCASE calls: none
SETFLG calls: none
SUMFIL calls:
   CHTIME   IOERR   LENSTR
CHTIME calls: none
PUTCLD calls:
   IOERR
PUTSLR calls:
   IOERR
SLRCNT calls: none
SURFAC calls:
   BDRF   DIREMS   FRESNL   PLANCK   PROFAC   REFEST
   ROUGH   SHADOW   XTERP
BDRF calls:
  DIREFL
DIREFL calls: none
SHADOW calls:
  DERF
DERF calls: none
DIREMS calls:
  EHBSL0
EHBSL0 calls:
  POLY
POLY calls: none
FRESNL calls: none
PLANCK calls: none
PROFAC calls:
  IBNSRC
REPEAT calls: none
ROUGH calls:
  EHBSL0

7.5.2  **FACET Cross-Reference List**

ADD called by:
  CNSTNT
BDRF called by:
  SURFAC
CHRCBD called by:
  PUTCLD
CHTIME called by:
  SUMFIL
CLDRBD called by:
  PUTCLD
CNSTNT called by:
  FACET
CONFIG called by:
  FACET
DADD called by:
  CNSTNT
DDIV called by:
  CNSTNT
DERF called by:
  SHADOW
DEVCB called by:
  FACET
DIREFL called by:
  BDRF
DIREMS called by:
  SURFAC
DIV called by:
  CNSTNT
DMUL called by:
  CNSTNT
DSUB called by:
  CNSTNT
EHBSL0 called by:
  DIREMS
FACET not called
FILTER called by:
  FACET
FRESNL called by:
  DIREMS
GERROR called by:
  IOERR
GETHDR called by:
  FACET

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GETVAR called by:
   FACET    RDRLTR
GETVEC called by:
   FACET
IBNSRC called by:
   PROFAC   XTERP
INFLED called by:
   FACET    RDRLTR
IOERR called by:
   FACET    RDRLTR    GETHDR    GETVAR    GETVEC    PUTCLD    PUTSLR
   RDRLTR    RDLINE    SUMFIL
LCTRIM called by:
   GETVEC   Parse    RDRLTR    RDLINE
LENSTR called by:
   GETVEC   Parse    RDRLTR    RDLINE    SUMFIL
LWCASE called by:
   FACET    RDRLTR
MUL called by:
   CNSTNT
PARSE called by:
   FACET    RDRLTR
PLANCK called by:
   FACET    RDRLTR
POLY called by:
   EHSBL0    SURFAC
PROFAC called by:
   SURFAC
PROMPT called by:
   FACET
PUTCLD called by:
   SUMFIL    SURFAC
PUTSLR called by:
   SUMFIL
RDRLTR called by:
   FACET
RDLINE called by:
   FACET    RDRLTR
REFEST called by:
   SURFAC
ROUGH called by:
   SURFAC
SETFLG called by:
   FACET
SHADOW called by:
   BDRF    FACET    SURFAC
SLR1BD called by:
   SLRCNT    SURFAC
SLRCNT called by:
   PUTSLR
SUB called by:
   CNSTNT
SUMFIL called by:
   FACET
SURFAC called by:
   FACET
UPCASE called by:
   FACET    RDRLTR
XTERP called by:
   FACET    FILTER    SURFAC

7.5.3 FACET Pre-Requisite Order List

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7.5.4 FACET Common Block Cross-Reference List

Common Block CONSTN used in:
   BDRF    CNSTNT    DIREMS    FACET    FILTER    FRESNL
   PLANCK  PROFAC    REFEST    ROUGH    SHADOW    SURFAC
   XTERP

Common Block DEVICE used in:
   DEVCD    FACET    PUTCLD    PUTSLR    RDFLTR    SUMFIL

Common Block HEADER used in:
   FACET    GETHDR    PUTCLD    PUTSLR    SUMFIL

Common Block MATRLD used in:
   FACET    SURFAC    SUMFIL

Common Block MOLECP used in:
   FACET    SUMFIL

Common Block USERNM used in:
   FACET    SUMFIL

Common Block FLTRDT used in:
   FILTER    RDFLTR    SUMFIL

Common Block CHRCNM used in:
   CHRCBD    PUTCLD    SUMFIL

Common Block CLDRN used in:
   CLDRBD    PUTCLD    SUMFIL

Common Block FLAGS used in:
   PUTSLR    SETFLG    SUMFIL

Common Block INFLTR used in:
   INFLBD    RDFLTR

Common Block SOLIR1 used in:
   SLR1BD    SLRCNT

Common Block DEVCNM used in:
   DEVCD    SUMFIL

Common Block MACHIN used in:
   DEVCD

7.6 FPTEST

7.6.1 FPTEST Subprogram References

FPTEST calls:
   CKSTAT
   CKSTAT calls:
      ZSTAT
      ZSTAT calls: none
      CNSTNT calls:
         ADD
         MUL

   ADD calls: none
   DADD calls: none
   DDIV calls: none
   DIV calls: none
   DMUL calls: none
   DSUB calls: none
   MUL calls: none
   SUB calls: none
   CONFIG calls: none
FLCOL1 calls:
  IOERR

IOERR calls:
  GERROR

GERROR calls: none

LRECHK calls:
  IOERR

PROMPT calls: none

TITLCR calls:
  FDATE

FDATE calls: none

### 7.6.2 FPTEST Cross-Reference List

ADD called by:
  CNSTNT

CKSTAT called by:
  FPTEST

CNSTNT called by:
  FPTEST

CONFIG called by:
  FPTEST

DADD called by:
  CNSTNT

DDIV called by:
  CNSTNT

DEVCBD called by:
  FPTEST

DIV called by:
  CNSTNT

DMUL called by:
  CNSTNT

DSUB called by:
  CNSTNT

FDATE called by:
  TITLCR

FLCOL1 called by:
  FPTEST

FPTEST not called

GERROR called by:
  IOERR

IOERR called by:
  FCOL1  LRECHK

LRECHK called by:
  FPTEST

MUL called by:
  CNSTNT

PROMPT called by:
  FPTEST

SUB called by:
  CNSTNT

TITLCR called by:
  FPTEST

ZSTAT called by:
  CKSTAT

### 7.6.3 FPTEST Pre-Requisite Order List

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7.6.4 FPTEST Common Block Cross-Reference List

Common Block CONSTN used in:
  CNSTNT FPTEST
Common Block DEVICE used in:
  DEVCBD FPTEST
Common Block MACHIN used in:
  DEVCBD FPTEST
Common Block DEVCNM used in:
  DEVCBD

7.7 INSTDB

7.7.1 INSTDB Subprogram References

INSTDB calls:
  CONFIG IOERR LCTRIM PROMPT RDSCN UPCASE
CONFIG calls: none
IOERR calls:
  GERROR
GERROR calls: none
LCTRIM calls: none
PROMPT calls: none
RDSCN calls:
  CITIES IBKCNV IOERR
CITIES calls: none
IBKCNV calls: none
UPCASE calls: none

7.7.2 INSTDB Cross-Reference List

CITIES called by:
  RDSCN
CONFIG called by:
  INSTDB
DEVCBD called by:
  INSTDB  RDSCN
ECOSBD called by:
  IBKCNV
GERROR called by:
  IOERR
IBKCNV called by:
  RDSCN
INSTDB not called
IOERR called by:
  INSTDB  RDSCN
LCTRIM called by:
  INSTDB  RDSCN
MOLNBD called by:
  INSTDB
PROMPT called by:
  INSTDB
RDSCN called by:
  INSTDB
UPCASE called by:
  INSTDB

7.7.3 INSTDB Pre-Requisite Order List

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7.7.4 INSTDB Common Block Cross-Reference List

Common Block DEVCNM used in:
DEVCBD INSTDB RDSCN

Common Block DEVICE used in:
DEVCBD INSTDB RDSCN

Common Block MOLNMX used in:
INSTDB MOLNBD

Common Block ECOCNV used in:
ECOSBD IBKCNV

Common Block ECOSYS used in:
ECOSBD

Common Block MACHIN used in:
DEVCBD

7.8 MRFLTR

7.8.1 MRFLTR Subprogram References

MRFLTR calls:
ATMOUT CNSTNT CONFIG DBINIT GETHDR INITL
IOERR PROMPT RDFLTR SETFLG SUMFIL

ATMOUT calls:
ATMINT ATMPRN BCKINT BCKPRN GETHDR IOERR
ZROINT

ATMINT calls:
FILTER IOERR

FILTER calls:
XTERP

XTERP calls:
IBNSRC

IBNSRC calls: none

IOERR calls:
GERORR

GERORR calls: none

ATMPRN calls:
INDEXK IOERR PRALT RELHUM SETBCK

INDEXK calls:
GBLBCK

GBLBCK calls:
AIRTMP RDGLB RDSCN

AIRTMP calls: none

RDGLB calls:
IOERR SEAICE

SEAICE calls: none

RDSCN calls:
CITIES IBKCNV IOERR

CITIES calls: none

IBKCNV calls: none

PRALT calls:
IBNSRC

RELHUM calls:
SATUR

SATUR calls: none

SETBCK calls:
INTR2D MODBCK

INTR2D calls: none

MODBCK calls: none

BCKINT calls:
FILTER IOERR

BCKPRN calls:
IOERR
GETHDR calls:
  IOERR
ZRCINT calls: none
CNSTNT calls:
  ADD
  MUL
  ADD calls: none
  DADD calls: none
  DDIV calls: none
  DIV calls: none
  DMUL calls: none
  DSUB calls: none
  MUL calls: none
  SUB calls: none
  CONFIG calls: none
DBINIT calls:
  IOERR
INITL calls:
  BEAUF T
  DFLT8
  GETASP
  GETSLR
  MDLATM
  STGEO M
  BEAUF T calls: none
  BINFIL calls:
    CHKRS T
    UPCODE
  CHKRST calls: none
  CHKVER calls: none
  DISEND calls: none
  FLSTAT calls: none
  UPCODE calls: none
  RDLIN E calls: none
  LCTRIM calls: none
  LENCEL calls: none
  CALEND calls: none
  CIRRUS calls: none
  DEFDLT calls: none
  EXOATM calls: none
  EXOTMP calls: none
  FILOPN calls: none
  GETVEC calls: none
  IOERR calls: none
  LCTRIM calls: none
  LENST R calls: none
  RDLIN E calls: none
  UPCODE calls: none
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  SETFLG calls: none

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7.8.3 MRFLTR Pre-Requisite Order List

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### 7.8.4 MRFLTR Common Block Cross-Reference List

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7.9 PLTGEN

7.9.1 PLTGEN Subprogram References

PLTGEN calls: COLGSKS PLTDRV

CLGSKS calls: none

CONFIG calls: none

GETHDR calls: IOERR

GERROR calls: GERROR

LCTRIM calls: none

OPNGKS calls: none

PLTDRV calls: AGSETC AGSETF AGSETI APPEND EZMXY IOERR

AGSETC calls: none

AGSETF calls: none

AGSETI calls: none

APPEND calls: LENSTR

LENSTR calls: none

EZMXY calls: none

PROMPT calls: none

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RDMRT calls:  
IOERR  SLITFN
SLITFN calls: none
UPCASE calls: none

7.9.2 PLTGEN Cross-Reference List

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  PLTDRV
AGSETF called by:  
  PLTDRV
AGSETI called by:  
  PLTDRV
AGUTOL called by:  
  PLTDRV  PLTGEN
APPEND called by:  
  PLTDRV
CHRCBD called by:  
  PLTDRV
CLSGKS called by:  
  PLTGEN
CONFIG called by:  
  PLTGEN
EZMXY called by:  
  PLTDRV
GERORR called by:  
  IOERR
GETHDR called by:  
  PLTGEN
IOERR called by:  
  GETHDR  PLTDRV  PLTGEN  RDMRT
LCTRIM called by:  
  PLTGEN
LENSTR called by:  
  APPEND
OPNGKS called by:  
  PLTGEN
PLTBD called by:  
  PLTDRV  RDMRT
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  PLTDRV  PLTGEN
RDMRT called by:  
  PLTDRV
SLITFN called by:  
  PLTDRV  RDMRT
UPCASE called by:  
  PLTDRV  PLTGEN

7.9.3 PLTGEN Pre-Requisite Order List

PLTGEN  PLTDRV  UPCODE  RDMRT  SLITFN  PROMPT
  EZMXY  APPEND  LENSTR  AGSETI  AGSETF  AGSETC
  OPNGKS  LCTRIM  GETHDR  IOERR  GERORR  CONFIG
  CLSGKS

7.9.4 PLTGEN Common Block Cross-Reference List

Common Block HEADER used in:
  GETHDR  PLTDRV  PLTGEN  RDMRT
Common Block CHRCNM used in:
    CHRCBD  PLTDRV
Common Block CHRPROM used in:
    PLTB D  PLTDRV
Common Block PLTPRM used in:
    PLTB D  PLTDRV    RDMSRT
Common Block RMODAT used in:
    PLTDRV    RDMSRT

7.10 **SCNGEN**

7.10.1 **SCNGEN Subprogram References**

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| GAUS |
| RUNIT |
| RUNIT |
| UNI |
| UNI |
| CONFIG calls: none
| FM2D calls: GAUS
| GETVAR calls: IOERR
| IOERR calls: GERROR
| GERROR calls: none
| IGTINT calls: IOERR
| IOERR |
| LWCASE calls: none
| PARSE calls: LCTRIM LENSTR
| LCTRIM calls: none
| LENSTR calls: none
| PROMPT calls: none
| ROLINE calls: IOERR LCTRIM LENSTR
| SCALE calls: CORF
| CORF calls:
| GAMMA |
| GAMMA calls: none
| KNU |
| KNU calls: GAMMA
| GAMMA |
| TDFTT calls: FOUR1
| FOUR1 calls: none
TILEIT calls: none
UPCASE calls: none
XTERP calls:
   IBNSRC
IBNSRC calls: none

7.10.2 **SCNGEN Cross-Reference List**

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7.10.3 **SCNGEN Pre-Requisite Order List**

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7.10.4 **SCNGEN Common Block Cross-Reference List**

Common Block CONSTN used in:
- CONSTNT
- SCNGEN

Common Block PIXEL used in:
- SCNGEN

7.11 **TERTEM**

7.11.1 **TERTEM Subprogram References**

**TERTEM calls:**
- AECALC
- GETVEC
- PARSE
- SETMP

**AECALC calls:**
- PLANCK

**PLANCK calls:** none

**CNSTNT calls:**
- ADD
- DADD
- DDIV
- DIV
- DMUL
- DSUB

**ADD calls:** none
**DADD calls:** none
**DDIV calls:** none
**DIV calls:** none
**DMUL calls:** none
**DSUB calls:** none
**MUL calls:** none
**SUB calls:** none
**CONFIG calls:** none
**FILRT calls:** none
**LCTRIM calls:** none
**GETHDR calls:** none
**IOERR calls:** none

550
IOERR calls: GERROR
GERROR calls: none
GETVAR calls: IOERR
GETVEC calls: LCTRIM LENSTR
LENSTR calls: none
HTBLINC calls: SRFLUX
SRFLUX calls: SATUR
EVapor calls: XTERP
XTERP calls: IBNSRC
IBNSRC calls: none
SATUR calls: none
IGTINT calls: IOERR
INTR2D calls: none
LWCase calls: none
PARSE calls: LCTRIM LENSTR
PROFAC calls: IBNSRC
PROMPT calls: none
RDLINE calls: LCTRIM LENSTR
RDUSRM calls: GETVAR NCHTER RDLINE UPCASE
NCHTER calls: LCTRIM UPCASE
UPCASE calls: none
SEATMP calls: none
SPCLYR calls: DenaIR THCICE
DenaIR calls: VIRIAL
VIRIAL calls: XTERP
DENWTR calls: none
SPHAIR calls: none
SPHICE calls: XTERP
SPHWTR calls: XTERP
THCAIR calls: none
THCICE calls: XTERP
THCSNW calls: none
THCWTR calls: XTERP

7.11.2 TERTEM Cross-Reference List

ADD called by:
  CNSTNT
AECALC called by:
  TERTEM
ATMSBD called by:
  TERTEM

551
BKGDBD called by: SPCLRY TERTEM
RDUSRNM
CHRCBD called by: TERTEM
CNSTNT called by: TERTEM
CONFIG called by: TERTEM
DADD called by: CNSTNT
DDIV called by: CNSTNT
DENAIR called by: SPCLRY
DENWTR called by: SPCLRY
DEVCBD called by: FILRT
TERTEM
DIV called by: CNSTNT
DMUL called by: CNSTNT
DSUB called by: CNSTNT
EVAPOR called by: SRFLUX
EXMLED called by: TERTEM
FILRT called by: TERTEM
GERROF called by: IOERR
GETHDR called by: TERTEM
GETVAR called by: TERTEM
RDUSRNM
GETVEC called by: TERTEM
HTBLNC called by: TERTEM
IBNSRC called by: PROFAC
XTERP
IGTINT called by: TERTEM
INTR2D called by: TERTEM
IOERR called by: GETHDR
GETVAR GETVEC IGTINT RDLINE TERTEM
LCTRIM called by: FILRT
LENSTR called by: GETVEC
LWCASE called by: TERTEM
MOLPBD called by: DENAIR
MUL called by: CNSTNT
NCHTER called by: RDUSRNM
OCNTBD called by: SEATMP
PARSE called by: TERTEM
552
PLANCK called by:
AECCAL

PROFAC called by:
TERTEM

PROMPT called by:
TERTEM

RDLINE called by:
TERTEM

RDUSR called by:
TERTEM

SATUR called by:
TERTEM

SEATMP called by:
TERTEM

SPCLYR called by:
TERTEM

SPHAIR called by:
TERTEM

SPHICE called by:
SPCLYR

SPHWTR called by:
SPCLYR

SRFLUX called by:
HTBLNC

SUB called by:
CNSTNT

TERTEM not called

THCAIR called by:
SPCLYR

THCICE called by:
SPCLYR

THCNSW called by:
SPCLYR

THCWTR called by:
SPCLYR

UPCASE called by:
RDUSR

NCHTER

VIRAL called by:

denair

VIRLBD called by:
VIRAL

XERP called by:

SPHICE

SPHWTR

TERTEM

THCICE

THCWTR

7.11.3 TERTEM Pre-Requisite Order List

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7.11.4 TERTEM Common Block Cross-Reference List

Common Block ATMDAT used in:
ATMSBD TERTEM

Common Block BACKGD used in:
BKGDBD RDUSR | SPCLYR | TERTEM

553
Common Block CHRCNM used in:  
CHRCBD  TERTEM  
Common Block CONSTN used in:  
CNSTNT  HTBLNC  TERTEM  XTERP  
Common Block DEVICE used in:  
DEVCBD  TERTEM  
Common Block EXTMOL used in:  
EXMLBD  TERTEM  
Common Block HEADER used in:  
GETHDR  TERTEM  
Common Block MOLDAT used in:  
DENAIR  MOLPBD  
Common Block DEVCMN used in:  
DEVCBD  FILRT  
Common Block TIMPCN used in:  
OCNTED  SEATMP  
Common Block VIRDAT used in:  
VIRIAL  VIRLBD  
Common Block MACHIN used in:  
DEVCBD  
Common Block MOLCON used in:  
MOLPBD

7.12 **VISUAL**

7.12.1 **VISUAL** Subprogram References

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7.12.2 **VISUAL Cross-Reference List**

ADD called by:
  CNSTNT
CHRCBD called by:
  PUTCLD
  SUMFIL
CHTIME called by:
  PUTCLD
CLDRBD called by:
  SUMFIL
CNSTNT called by:
  PUTCLD
COLOR called by:
  VISUAL
CONFIG called by:
  VISUAL
DADD called by:
  CNSTNT
DDIV called by:
  CNSTNT
DEVCBD called by:
  FILRT
  PUTCLD
  PUTSLR
DIV called by:
  CNSTNT
DMUL called by:
  CNSTNT
DSUB called by:
  CNSTNT
FILRT called by:
  VISUAL
ERROR called by:
  IOERR
GETHDR called by:
  VISUAL
HUMAN called by:
  VISUAL
IBNSRC called by:
  XTERP
IOERR called by:
  PUTCLD
  PUTSLR
  SUMFIL
  VISUAL
LCTRIM called by:
  FILRT
LENSTR called by:
  SUMFIL
MUL called by:
  CNSTNT
NRMLZ called by:
  VISUAL
PROMPT called by:
  VISUAL
PUTCLD called by:
  VISUAL
PUTSLR called by:
  SUMFIL
SETFLG called by:
  VISUAL
SLR1BD called by:
  SLRCNT
SLRCNT called by:
  PUTSLR
SUB called by:
  CNSTNT
SUMFIL called by:
  VISUAL
SUMIT called by:
  VISUAL
VISUAL not called
XTERP called by:
  HUMAN

7.12.3 VISUAL Pre-Requisite Order List

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7.12.4 VISUAL Common Block Cross-Reference List

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