SP-3
JULY 1990

(2)

PROGRESS ON DATA ACCESSION AND PREPARATION OF USER'S GUIDES

C. AARON LAI
INSTITUTE FOR NAVAL OCEANOGRAPHY

Approved for public release: distribution is unlimited. Institute for Naval Oceanography, Stennis Space Center, MS 39529-5005

ABSTRACT

INO's progress on data accession for use in model experiments and evaluation under the Experimental Center for Mesoscale Ocean Prediction (ECMOP) Project is described. Also discussed is the status of the preparation of user's guides for climatology, hurricane, MOODS, and GEOSAT data, as well as the design of an INO data library.

TABLE OF CONTENTS

Page

PROGRESS ON DATA ACCESSION AND PREPARATION OF USER'S GUIDES

1. INTRODUCTION AND BACKGROUND

Data are the results of scientific observation and experimentation (or modeling). They are the foundation of sciences. By means of analysis, data are rendered into theories and then formulated into mathematical forms. Experiments and models are thus designed and executed. Observed data are used as the input to the models or as the calibration measures for the experiments. The data obtained from the modeling and experimentation are the forecasts, and they can be used to verify against theories. Figure 1 depicts the relationship between data, theory, and model.

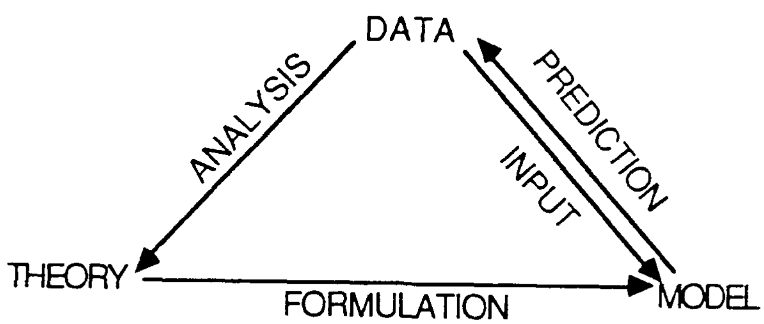


Figure 1. The relationship between data, theory, and model.

Current remote sensing facilities produce almost one trillion bits of information per day. The interdisciplinary geophysical data (climate, land, ocean, and atmosphere) span wide ranges of time, space, sources, and types. At present, we have tabulated, digitized, graphed, archived, and then published data. There is still much to be done with data to make good use of it. In fact, researchers in the geophysical sciences have a common feeling that data preparation consumes a significant portion of time and manpower in a research project. Therefore, in the process of implementing INO's Data Support System in the Experimental Center for Mesoscale Ocean Prediction, a task team was formed in August 1989.

2. OBJECTIVES

The task objectives were to compile the initial data set, and to prepare associated documentation (user's guides) for each data type. Sub-objectives were to identify the initial data sets in a beginning data library, and to outline the contents of a user's guide for each data type in the library.

In the process of identifying the objectives, a joint task effort between NAOPS and ECMOP was formed, with the following specific objectives:

a. To access, process, and consolidate input data sets for PEDAM/GOM assessment/experiments.

b. To implement the EMPRESS Data Base Management System (DBMS) on the SUN Server.

c. To expand the data base by acquiring and processing other research and operational data sets from FNOC, NCAR, NCDC, NAVO, etc.

d. To merge the system structure with INFOSS and VERMOD.

The task to construct an initial INO data base was divided into three sub-tasks as follows:

a. Climatology data base
- To ingest the Levitus (T, S) and Hellerman wind stress data sets into DBMS.
- To acquire, process, and ingest the MOODS and FNOC CLIMASTER data sets into DBMS.

b. Operational data base
- To access and process the FNOC historical SPOT reports and NOGAPS (or NORAPS) fields and ingest them into DBMS.
- To establish an account with FNOC/NODS in order to receive real-time or delayed real-time data sets for future use.

c. Research data base
- To generate, organize, and ingest the altimetry data set into DBMS.
- To acquire from NCDC, process, and ingest the MCSST data set into DBMS.
- To ingest Hurricanes Anita, Camille, and Frederic forcing data sets into DBMS.

- To acquire, process, and ingest other atmospheric forcing data sets into DBMS.

3. TASK TEAM WORKING GROUPS AND ORGANIZATION

INO scientists and computer personnel were assigned to three working groups and were organized as shown in Figure 2.

4. DATA POLICY

To provide the best service to the INO research/technical groups and related non-INO ocean community, ECMOP adheres to the following data policy:

- The goal of the DASS task must be **reasonably ambitious.**
- The data acquisition plan should match the justified research/development task requirement.
- Cooperative data users should consult the data preparer in defining the priority of data preparation. Both sides take the responsibility of making the data available.
- Contributory data users of the INO database, either INO personnel or non-INO researcher, should contribute his/her data, scientific/technical advice, software, or administrative support in exchange for access to the data and service.
- Follow the data proprietary agreement and maintain access control.
- Advocate data quality control and standard formats with the contributing scientist responsible.
- Explore international data resources, for example, data from WOCE Intensive Observation Period.
- INO categories of data support:
  - (i) INO fully support: Data sets required by research project. DASS group will obtain them, provide documents and maintenance (with Scientist, if necessary).
  - (ii) Partially support: Data sets for experiments. DASS will help in acquiring if it can. No facility support.

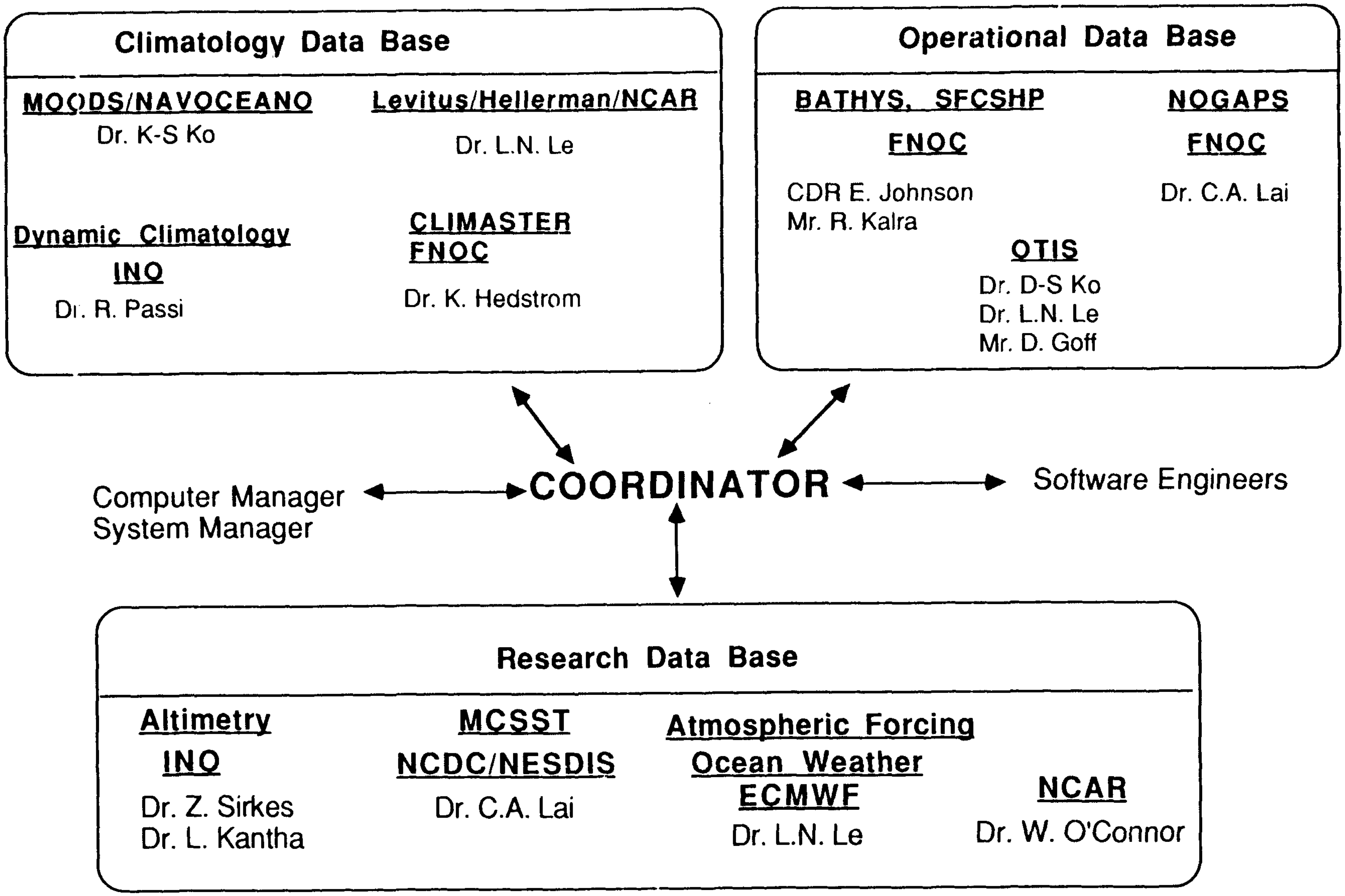


Figure 2. Task Team Working Groups/Organization

(iii) No support: Data sets developed personally. An individual can put on the machine if he/she has room.

All data must fall within one or the other. They may shift with time.

5. ACCOMPLISHMENTS

5.1 Data Library

The first step taken by the task team was to build a data library. As shown in Table 1, this library provides the data set name, source tape, originator, data type, structure, variable name, spatial domain/resolution, and temporal domain/resolution for every data set collected and related to the INO research program.

5.2 Acquire User's Guides for Data Sets

The second step taken was to provide the user's guides for collected data sets. To date, several user's guides have been prepared, including two for Levitus climatology data sets, one for Hellerman climatology, three for hurricane forcing events, and one for the newly acquired MOODS data set. These user's guides are included in the Appendices A through C with an outline of the user's guide for GEOSAT SSH provided in Appendix D.

5.3 Status of Data Sets

The status of data sets presently at INO includes:

a. Levitus Climatology

   Two sets with different numbers of levels in the vertical are ready to be put into the DBMS, and user's guides have been written.

b. Hellerman Climatology

   Same as Levitus with one data set.

c. Hurricane data sets

   Same as Levitus with three data sets.

d. GEOSAT SSH

   SSH data from 27 tapes were compressed and stored on disk creating a global data set for the period November 1986 to April 1989. A quality control program was applied and about 0.5% of the data were rejected. A time series approximation to the orbit error was calculated from the difference between the

TABLE 1. Current Data Library

#	Data Set Name	Report vs. Field	Variables	SPATIAL		TEMPORAL	
				Domain	Resolution	Domain	Resolution
1	Levitus (NCAR)	Field	T(z), S(z) $0_2(z)$	3-D, 33 levels, Global	$1^\circ \times 1^\circ$	Annual	One Set
2	Levitus (NCAR)	Field	T(z), S(z)	3-D, 24 levels, Global	$1^\circ \times 1^\circ$	4 Season's	Seasonal: Winter, Spring Summer, Fall
3	Levitus (NODC)	Report	T(:), S(z) $0_2(z)$	Global 500,000 Reports	Lat., Long., Country	1977 1978	
4	Hellerman (NCAR)	Field	Wind Stress τx, τy	Global Ocean 2-D	$2^\circ \times 2^\circ$	12 months & 4 seasons	monthly & seasonal
5	MOODS (NAVO)	Report	T(z), S(z) C (z)	Gulf of Mexico	Lat., Long.	1977 ~ 1979 1980 ~ 1986	
6	DBDB5	Field	(ocean depth) Topography	80 °S → 80 °N	5' x 5'	Permanent	Permanent
7	Hurricanes (Ocean Weather)	Field	Sea Surface Pressure, τx, τy	Gulf of Mexico 2-D	$\frac{1}{5}^\circ \times \frac{1}{5}^\circ$	3 Days	$\frac{1}{2}$ hr

TABLE 1. Current Data Library (Cont'd)

#	Data Set Name	Report vs. Field	Variables	SPATIAL Domain	SPATIAL Resolution	TEMPORAL Domain	TEMPORAL Resolution
8	Samuel & Cox (GFDL)	Field	Surface τ P-E, T, S	2-D Global	$1^\circ \times 1^\circ$	Annual & Monthly	Annual Average & Monthly
9	Sirkes (INO)	Register, Track	SSH, Level I	Global	$\frac{1}{2}^\circ \times \frac{1}{2}^\circ$ for base check 10Km pixel	Nov. 1986 → April 1989	17 days
10	Dynamic Climatology (INO)	Field	T(z), S(z) V(z)	3-D Gulf of Mexico	$\frac{1}{5}^\circ \times \frac{1}{5}^\circ$	Annual	Daily for one year
11	MCSST (NCDC)	Field	T(Sea Sur-face)	2-D Global	$\frac{1}{8}^\circ \times \frac{1}{8}^\circ$	1986, Nov., Dec. 1987 ~ 1988	Weekly
12	NOGAPS (FNOC)	Field	Wind, T(air) Heat Flux, Precipi-tation	Global or Regional 2-D 73 x 144	Variable depends on area	Two Month Nov. & Dec. 1986	12 Hr
13	(FNOC) Climaster	Field	T(z), S(z)	3-D		Climatology,	One Set
14	(FNOC) SPOT	Reports	T,S, wave SST	2-D		2 mo. Nov.-Dec. 1986	Daily

#	Data Set Name	Report vs. Field	Variables	SPATIAL		TEMPORAL	
				Domain	Resolution	Domain	Resolution
15	NODC-CTD (NODC)	Report	T(z), S(z) C (z)	Gulf of Mexico	Lat., Long.	1983-1986	
16	MOODS (NAVO)	Report	T(z), S(z) C(z)	N.Atlantic & part of S. Atlantic	Lat., Long. 50,000 reports	1977-1986	
17	MCSST (NASA/JPL)	Field	SST	2-D Global	18 km	Nov. 1986 ~ June 1989	Weekly
18	GDEM (NAVO)	Field	T(z), S(z) C(z)	N. Atlantic Mediter. & part of S. Atlantic	30' x 30'	4 Seasons	Seasonal
19	ETOPO5 (NCAR)	Field	Land elevation & ocean depth	Global	5' x 5'	Fixed	Fixed
20	Coastline (NCAR)	Geography	Coastline	Global	Coarse & Fine	Fixed	Fixed
21	ECMWF Wind Climatology	Field	Wind Stress	Global	$2.5^{\circ} \times 2.5^{\circ}$	12 Months	Monthly
22	MOODS-F (FNOC)	Report	T(z), S(z) C(z)	N. Atlantic & N.E. Pacific	Lat., Long.	Nov.-Dec. 1986 1987, 1988	

TABLE 1. Current Data Library (Cont'd)

#	Data Set Name	Report vs. Field	Variables	SPATIAL		TEMPORAL	
				Domain	Resolution	Domain	Resolution
23	AVHRR (NCDC)	Registered Track	Single channel images	E. Pacific		1986	
24	GEOSAT	Registered Track	Images	E. Pacific	50-degree arcs	1986	
25	IN-SITU (OPTOMA)	Report	T(z), S(z) C(z)	E. Pacific	Lat., Long.,	1986	
26	WINDS	Field	U, V in MBL	2-D Global		July - Dec. 1986	Daily
27	BUOYS GOM	Report	T_{air}, SST, P, Wind	Part of GOM	Lat., Long.	1989	

GEOSAT measurement and the model geoid. Spectral analysis of the autocovariance function of this time series revealed the major frequencies in the orbit error. These frequencies were used in a least square fit to each day's data. Programs were developed to calculate average values over ascending and descending tracks globally. These averages were calculated for the first 50 repeat cycles for the original data and for the orbit error reduced data. A program was developed to calculate crossover points and crossover differences between ascending and descending tracks. This program was applied to the original data and to the orbit error reduced data. It showed a RMS error of 3 m for the original data and 1.7 m for the orbit error reduced data. An outline of the content of the user's guide was prepared.

e. FNOC Data

- Have acquired MOODS and NOGAPS data sets.

f. MCSST data sets

- Have requested and received "NOAA Polar Orbiter Data User's Guide."
- MCSST data sets from NCDC and from NASA/JPL have been processed and provided for PEDAM/GOM experiments.

5.4 Data Library Design

ECMOP is developing a long-term structure for the data library to guide the implementation of DBMS. The data library design is included in Appendix E.

5.5 Data Base Management System

To handle several large data sets and provide easy, efficient access, a DBMS is required. Figure 3 displays the concept of organizing different data records into the DBMS with appropriate attributes. Since NEPRF/NEONS and ECMOP/DASS DBMS's have common DBMS work areas, much of the NEONS design is used in DASS. Figure 4 is a sample design for a climatology data base.

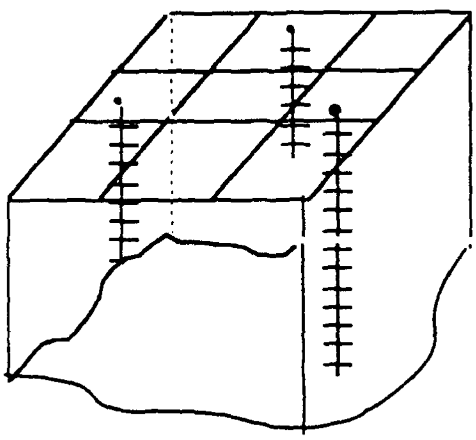
6. SCHEDULE

The task team will keep acquiring data sets and upgrading/expanding the data base in accordance with the schedule shown in Figure 5. The schedule assumes the following:

X (lat), y (long), z (depth), level, t (year, month, day, hour)
variable(s), other (instrument, code, source, country, etc.)

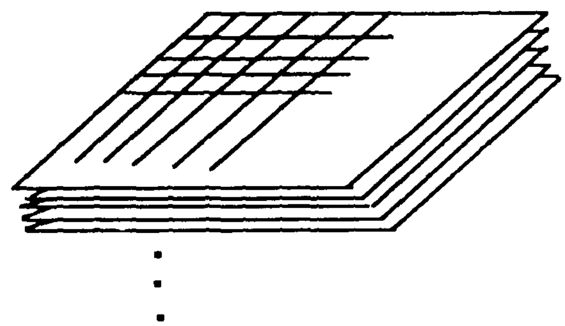
variable (x, y, z, t, etc.)

Reports (ASCII)



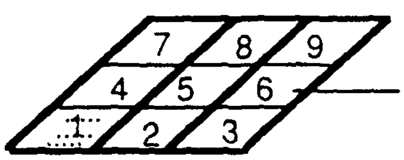
Variable -Z (x, y, t)
Report

Fields (Binary)



(grid, projection)
Horizontal field (variable,
z (level), t)

MCSST (ASCII or Binary)



Mardzen
Square

SST - MS (x, y, t)
#

Altimetry - GEOSAT
Images

Figure 3. Attributes to be used for data base

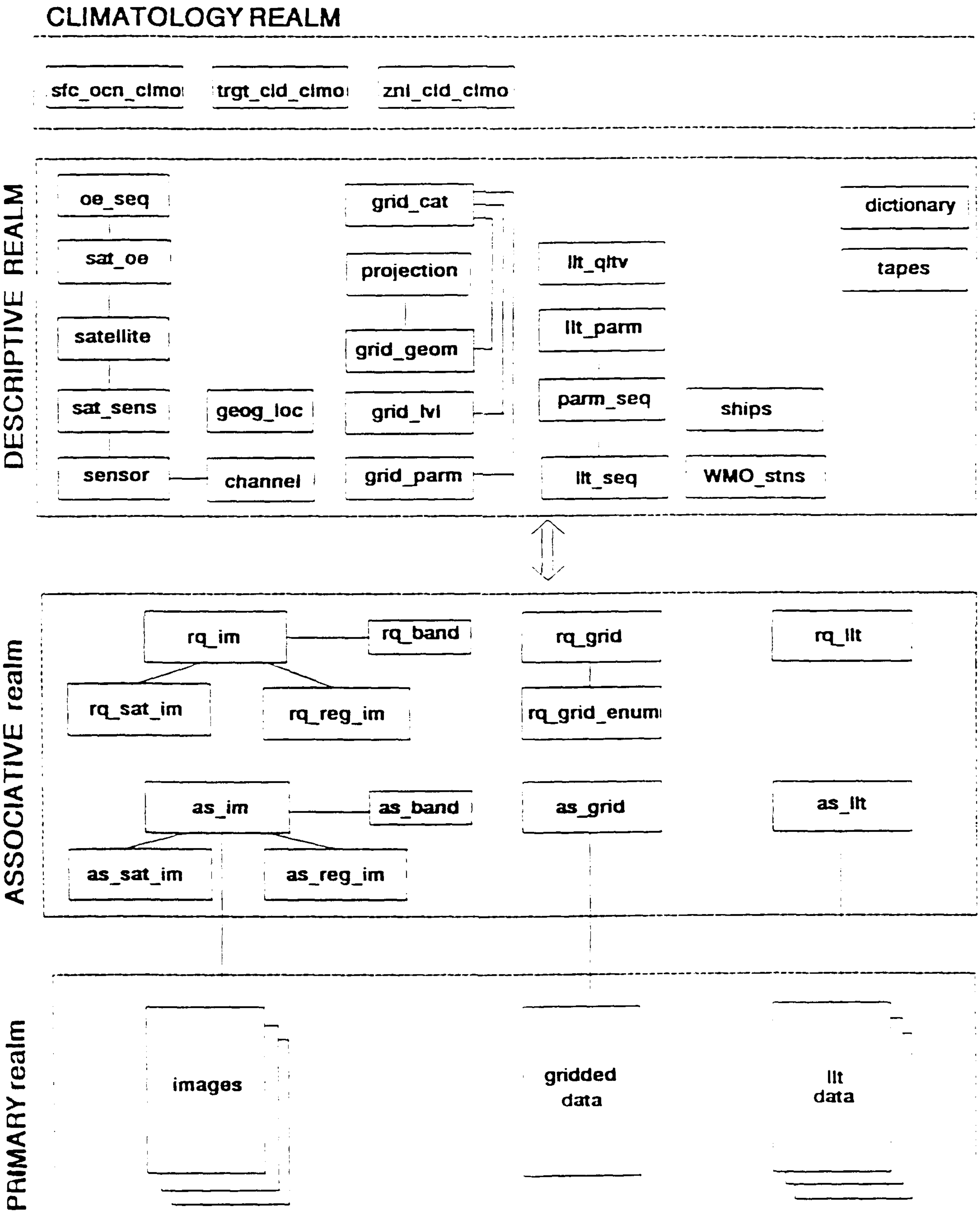

CLIMATOLOGY REALM
sfc_ocn_clmo
trgt_cld_clmo
znl_cld_clmo
DESCRIPTIVE REALM
oe_seq
sat_oe
satellite
sat_sens
sensor
geog_loc
channel
grid_cat
projection
grid_geom
grid_lvl
grid_parm
llt_qltv
llt_parm
parm_seq
llt_seq
ships
WMO_stns
dictionary
tapes
ASSOCIATIVE realm
rq_im
rq_band
rq_sat_im
rq_reg_im
rq_grid
rq_grid_enum
rq_llt
as_im
as_band
as_sat_im
as_reg_im
as_grid
as_llt
PRIMARY realm
images
gridded data
llt data

Figure 4

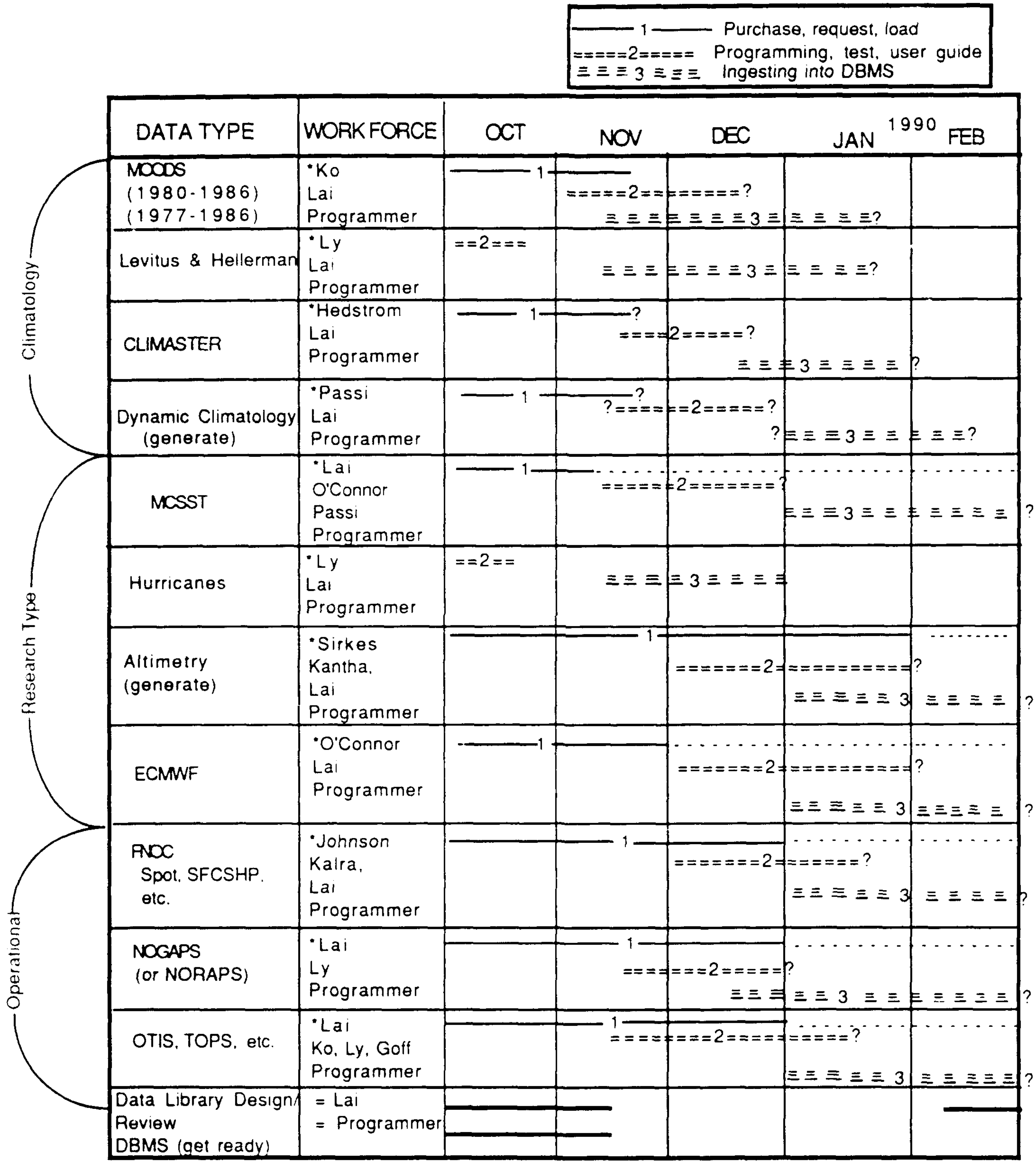


Figure 5. Schedule

- The installation of EMPRESS is completed by 15 November 1989.
- Scientific programmers acquire the DBMS skill from NEPRF/NEONS experts by 15 November 1989.
- There are no hardware restrictions.

By mid-1990, INO anticipates accomplishing the following:

- MOODS (1977 to 1986), Levitus, Hellerman, CLIMASTER, and hurricane data sets are ready in the DBMS.
- Initial sets of MCSST, GEOSAT altimetry, dynamic climatology (GOM), and some FNOC data are available on DBMS.
- The DBMS is ready for archiving model output.

7. FY91 PLANNED TASKS

a. Acquire and prepare MOODS, MCSST, GEOSAT, surface fluxes, wind stress, and dynamic height data sets (1987 and 1988) for the NAOPS Pre-Assessment Experiment using the Princeton Gulf Stream model.

b. Acquire and prepare current-meter data for the NW Atlantic area to build a model verifying data set.

c. Collect SYNOP data sets (T, S, U, V, SST, etc.) from SYNOP PIs who agree to contribute data to INO. This data will be used only for INO modeling efforts, unless the individual PI indicates a desire to exchange data with other groups. SYNOP PI proprietary rights will be honored by INO personnel.

d. Convert all data sets and related software packages from the VAX 8800 to its replacement (scheduled for FY91).

e. Establish university and research laboratory data support to include:
   - Preparation of data sets into the EMPRESS DBMS.
   - Consolidate all INO data sets onto one dedicated magnetic disk on the VAX replacement computer.
   - Maintain an on-line data library catalog and file of user's guides.

f. Prepare software packages for data transport between the Class VII LSC, VAX replacement computer, and the optical disk device and tape drives.

g. Link the DASS DBMS with NOAA/COAP's DBMS, and the FNOC quasi-operational data channel, via a dedicated line or via the network. Test the bridge to NEONS, and set up the schema.

h. Incorporate REX/ROPE data sets into the research quality data archive for future experiments in the NW Atlantic.

Figure 6 shows the planned starting dates and the expected duration of work.

The INO deliverables anticipated in FY91 include:

1 February 1991	Data sets of T, S, SST, surface fluxes are completed for the FY91 Pre-Experiment using the Princeton Gulf Stream model.
15 February 1991	Complete initial data support package.
1 May 1991	Complete verification data sets (T, S, U, V) for the FY91 Pre-Experiment using the Princeton Gulf Stream model.
30 September 1991	Expand INO Data Library to include new data sets such as GDEM, SYNOP, REX, current-meter data, etc.
30 September 1991	DBMS operational with optical disk device and dedicated magnetic disk.

DASS PLAN

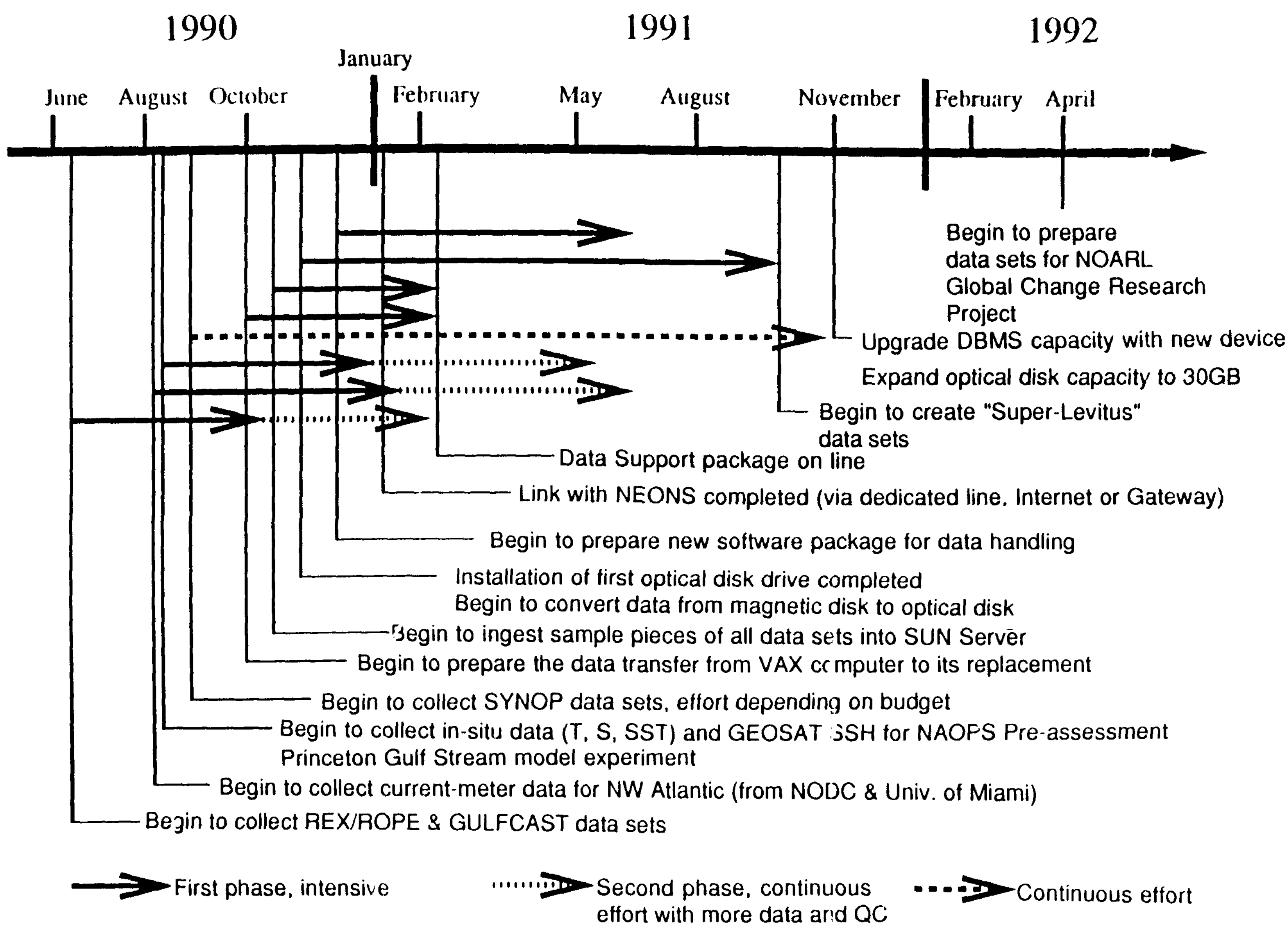


Figure 6

APPENDIX A

INO USER GUIDE FOR CLIMATOLOGY DATA
VERSION 1.0

Preparer: Le Ngoc Ly

Data Set Names:

Levitus 33-level global
Levitus 24-level global
Hellerman Global Wind Stress

Appendix A

INO User Guide for Climatology Data
Version 1.0

1. Introduction:

- Data set name: Levitus.
- Variables: $T(z), S(z), O_2$

2. Audit Trail:

Version	*Revision date*	*Prepare*	*Soft.*	*Algor.*	*Remarks*
1	Sept. 30. 89	Le			

- Class: *II*
- Source: NCAR (Steven Worley)
- Author: Levitus (Data based on NODC to 1977)
- Tape name: 755 ASC

3. Properties of data set:

- Spatial domain. resolution: 33 levels. global.

  42164 columns. $1^0 \times 1^0$ resolution.

- Temporal domain. resolution: Annual. one set.

- Style (report or field): field.
- Structure: $3-D$ ($I = 1$ corresponds 0.5 E long and $I = 360$ at 0.5 W long; $J = 1$ corresponds 89.5 S lat and $J = 180$ at 89.5 N lat.).

4. Volume and format of data set.

- Record length: 80
- Block size: 4000
- Computer Code: ASCII
- 4 files
- Format: FORMAT(14I5)
- Data Depth:

  0.0, 10.0, 20.0, 30.0, 50.0, 75.0, 100.0, 125.0,
  200.0, 250.0, 300.0, 400.0, 500.0, 600.0, 700.0,
  800.0, 900.0, 1000.0, 1100.0, 1200.0, 1300.0, 1400.0,
  1500.0, 1750.0, 2000.0, 2500.0, 3000.0, 3500.0, 4000.0,
  4500.0, 5000.0, 5500.0, 6000.0

1. Introduction:

- Data set name: Levitus.
- Variables: $T(z), S(z)$

2. Audit Trail:

Version	*Revision date*	*Prepare*	*Soft.*	*Algor.*	*Remarks*
1	Sept. 30. 89	Le			

- Class: *II*
- Source: NCAR (Steven Worley)
- Author: Levitus (Base on NODC to 1977)
- Tape name: 753 ASC

3. Properties of data set:

- Spatial domain, resolution: 24 levels, global.

  42164 columns, $1^0 \times 1^0$ resolution.

- Temporal domain. resolution: Seasonal (Winter. Spr. Sum . Fall).
- Style (report or field): field.
- Structure: $3-D$ ($I = 1$ corresponds 0.5 E long and $I = 360$ at 0.5 W long: $J = 1$ corresponds 89.5 S lat. and $J = 180$ at 89.5 N).

4. Volume and format of data set.

- Record length: 80
- Block size: 4000
- Computer Code: ASCII
- 8 files
- Format: FORMAT(14I5)
- Data Depth:

  0.0. 10.0. 20.0. 30.0. 50.0. 75.0. 100.0. 125.0.

  200.0. 250.0. 300.0. 400.0. 500.0. 600.0. 700.0.

  800.0. 900.0. 1000.0. 1100.0. 1200.0. 1300.0. 1400.0.

  1500.0. 1750.0. 2000.0

1. Introduction:

   - Data set name: Hellerman
   - Variables: τ_x, τ_y

2. Audit Trail:

Version	*Revision date*	*Prepare*	*Soft.*	*Algor.*	*Remarks*
1	Sept. 30. 89	Le			

   - Class: *II*
   - Source: NCAR (Steven Worley)
   - Author: Hellerman (Base on observation from 1870 to 1976)
   - Tape name: 752 ASC

3. Properties of data set:

   - Spatial domain, resolution: global $2^0 \times 2^0$ resolution.

- Temporal domain, resolution: 12 Months, 4 Seasons (Winter, Spr, Sum , Fall).
- Style (report or field): field.
- Structure: 2-*D*.

4. Volume and format of data set.

- Record length: 120
- Block size: 6000 (3 Mbytes)
- Computer Code: ASCII
- Format: FORMAT(15F8.4))

APPENDIX B

INO USER'S GUIDE FOR HURRICANE DATA

Preparer: Le Ngoc Ly

Data Set Names:

Hurricane Anita
Hurricane Camille
Hurricane Frederic

APPENDIX B

INO USER GUIDE FOR HURRICANE DATA

1. Introduction:

   - Data set name: Hurricanes (Anita, Camille, and Frederic)
   - Variables: $\tau_x, \tau_y, SeaSurfacePressure$

2. Audit Trail:

Version	*Revision date*	*Prepare*	*Soft. Algor.*	*Remarks*
1	Sept. 30. 89	Le		

   - Class: *II*
   - Source: Oceanweather (V. Cardone)
   - Author: Oceanweather (V. Cardone)
   - Tape name: Hurricanes (Camille, Anita, Frederic)

3. Properties of data set:

   - Spatial domain, resolution: GOM $0.2^0 \times 0.2^0$ resolution.

- Temporal domain, resolution: 3 days, 1/2 hour resolution.
- Style (report or field): output of model.
- Structure: 2-*D*.

4. Volume and format of data set.

- Record length: 80
- Block size: 5360
- Density 6250 bpi
- Tape contains 3 files
- File 1 : Anita (169 time steps, 2535 blocks); File 2: Camille (97 time steps; 1455 blocks); File 3: Frederic (97 time steps; 1455 blocks)
- Computer Code: ASCII
- Format: FORMAT(16F5.3) for τ_x and τ_y
- Format: FORMAT(16F5.1) for pressure

APPENDIX C

INO USER'S GUIDE FOR MOODS DATA

Preparer: Dong-Shan Ko

Data Set Name:
MOODS (1977-1979)

APPENDIX C

INO USER'S GUIDE FOR MOODS DATA

MOODS_GOM_01 DATA SET

1. Introduction

a. Data Set Name : MOODS_GOM_01

b. Origin of Data Set : MOODS (NAVOCEANO)

c. Data File Name : DUA1:[LAI.MOODS]MOODS_GOM.DAT (VAX/INO)

d. Subroutine to Read Data Set : DUA1:[LAI.MOODS]READ_MOODS.FOR

2. Properties of Data Set

a. Spatial Domain : Longitude : 98.00W - 80.00W; Latitude : 15.00N - 31.00N

b. Temporal Domain : 1977 - 1979

c. Type : Casting report

d. Structure : 1-D (Depth, Temperature, Salinity, Sound Speed)

e. Number of Record : 1901 (1977 - 637; 1978 - 792; 1979 - 472)

```
Directory DUA1:[LAI.MOODS]

MOODS_GOM.DAT;2                   File ID:  (3507,3,0)
Size:         4496/4497           Owner:    [INO,LAI]
Created:  15-SEP-1989 13:14:04.99
Revised:  18-SEP-1989 16:55:27.12 (17)
Expires:   2-FEB-2017 16:55:27.12
Backup:   17-SEP-1989 09:46:46.24
File organization:  Sequential
File attributes:    Allocation: 4497, Extend: 0, Global buffer count: 0, No vers
ion limit
Record format:      Fixed length 80 byte records
Record attributes:  None
RMS attributes:     None
Journaling enabled: None
File protection:    System:RWED, Owner:RWED, Group:RE, World:
Access Cntrl List:  None

Total of 1 file, 4496/4497 blocks.
```

```
C -----------------------------------------------------------------
C                 ==================================
                        SUBROUTINE  READ_MODDS
C                 ==================================
C ARGUMENTS :
     1  (INIT,
     2   XLAT,XLONG,IYEAR,IMONTH,IDAY,IHOUR,IMIN,
     2          ITYPE,ISORCE,NLEV,NPAR,NCRUSE,NCLASS,IENDEP,IBATHY,
     3   DATA)
C                            VERSION 1.0
C                      D.S.KO/INO  SEP. 13, 1989
C -------------------------------------------------------------------
C
C         PROGRAM TO READ DATA FILE : MOOD_GOM_01 (1901 RECORDS)
C
C CONTROL VARIABLE :
C
C         INIT = 0 - OPEN FILE AND READ FIRST RECORD
C              = 1 - READ NEXT RECORD
C              = 9 - READ NEXT RECORD AND CLOSE FILE (I)
C                  - LAST RECORD IS READED AND FILE IS CLOSED (O)
C
C DATA VARIABLES :
C
C       * HEADER -
C
C         XLAT   - LATITUDE IN DECIMAL DEGREES
C         XLONG  - LONGITUDE IN DECIMAL DEGREES
C                  (N/E - POS)  (S/W - NEG)
C         IYEAR  - YEAR
C         IMONTH - MONTH
C         IDAY   - DAY
C         IHOUR  - HOUR
C         IMIN   - MIN
C         ITYPE  - INSTRUMENT TYPE
C         ISORCE - DATA SOURCE
C         NLEV   - NUMBER OF CYCLES OF DATA PER OBSERVATION
C         NPAR   - NUMBER OF PARAMETERS
C                  2 - DEPTH,TEMP
C                  3 - DEPTH,TEMP,SAL
C                  4 - DEPTH,TEMP,SAL,SNDSPD
C         NCRUSE - CRUISE NUMBER
C         NCLASS - CLASSIFICATION
C         IENDEP - CAST DEPTH
C         IBATHY - BOTTOM DEPTH
C
C       * DATA -
C
C         DATA (MAXPAR, NLEV)
C               [MAXPAR - 4]
C               DATA (1, NLEV) - DEPTH IN METER
C               DATA (2, NLEV) - TEMPERATURE IN DEGREE
C               DATA (3, NLEV) - SALINITY IN PART PER THOUSAND
C               DATA (4, NLEV) - SOUND SPEED IN METER PER SECOND
C
C -------------------------------------------------------------------
C
      PARAMETER  (MAXPAR=4, MAXREC=1901)

      DIMENSION  DATA(MAXPAR,1)

C -----------------------------------------------------------------
C     OPEN DATA FILE
C -----------------------------------------------------------------
C
      IF (INIT.EQ.0) THEN
```

```
C
      .OPEN(UNIT=12,FILE='DUA1:[LAI.MOODS]MOODS_GOM.DAT',
     *   FORM='FORMATTED',STATUS='OLD',READONLY)
C
         INIT = 1
         IREC = 0
      END IF
C ----------------------------------------------------------------------
C     READ  HEADER
C ----------------------------------------------------------------------
C
      READ(12,10,END=90,ERR=80) XLAT,XLONG,
     1                          IYEAR, IMONTH,IDAY,  IHOUR, IMIN,
     2                          ITYPE, ISORCE,NLEV,  NPAR,
     3                          NCRUIS,NCLASS,IENDEP,IBATHY
   10 FORMAT (2F8.2, I4,2I2, I4,I2,2X, I4,1X,I3, I6, I2, 4I8)
C
C ----------------------------------------------------------------------
C     READ DATA DEPENDS ON # OF PARAMETERS(NPAR)
C ----------------------------------------------------------------------
C
      IF (NPAR .EQ. 2) THEN
         ICOL = 5
         DO 221 N = 1,NLEV,ICOL
         READ(12,222)((DATA(I,J),I=1,NPAR),J=N,N+ICOL-1)
 222     FORMAT(5(F8.0,F8.2))
 221     CONTINUE
      ENDIF
C
      IF (NPAR .EQ. 3) THEN
         ICOL = 4
         DO 225 N = 1,NLEV,ICOL
         READ(12,226)((DATA(I,J),I=1,NPAR),J=N,N+ICOL-1)
 226     FORMAT(4(F6.0,2F7.2))
 225     CONTINUE
      ENDIF
C
       IF (NPAR .EQ. 4) THEN
         ICOL = 2
         DO 228 N = 1,NLEV,ICOL
         READ(12,229)((DATA(I,J),I=1,NPAR),J=N,N+ICOL-1)
 229     FORMAT(2(4F10.2))
 228     CONTINUE
       ENDIF
C
C --- SET TOTAL READ COUNTER ---
C
      IREC = IREC + 1
C
      IF (IREC.LT.MAXREC) RETURN

90    WRITE (6,190) IREC
190   FORMAT (/5X,'*** HIT EOF, FILE CLOSED, THE LAST RECORD # IS',I6/)
      INIT = 9
99    CLOSE (UNIT=12)

      RETURN

80    WRITE (6,180) IREC+1
180   FORMAT (/5X,'*** READ ERROR AT RECORD # :',I6/)
      STOP

      END
```

01321	(28.13,	-86.70)	1979/05/15	00:00	MSG	8	0:	457	1250	Z,T
01322	(28.55,	-86.77)	1979/07/16	00:30	MSG	11	0:	305	600	Z,T
01323	(28.08,	-86.68)	1977/08/22	00:01	MSG	8	0:	457	2013	Z,T
01324	(28.88,	-86.78)	1979/09/13	09:21	MSG	6	0:	287	470	Z,T
01325	(28.03,	-86.38)	1978/09/08	15:34	MSG	6	0:	399	2025	Z,T
01326	(28.30,	-86.60)	1978/11/21	00:40	MSG	8	0:	460	828	Z,T
01327	(28.17,	-86.40)	1978/11/18	18:00	MSG	13	0:	433	872	Z,T
01328	(28.00,	-86.00)	1978/11/05	21:35	MSG	4	0:	299	1026	Z,T
01329	(28.02,	-86.80)	1977/12/31	00:00	MSG	13	0:	305	2422	Z,T
01330	(28.47,	-86.98)	1977/12/13	06:00	MSG	13	0:	305	869	Z,T
01331	(28.50,	-86.00)	1978/12/04	16:45	MSG	11	0:	360	303	Z,T
01332	(28.00,	-86.00)	1978/12/04	16:54	MSG	11	0:	351	1026	Z,T
01333	(28.40,	-86.93)	1979/12/22	02:00	XBT	4	0:	457	873	Z,T
01334	(28.30,	-85.15)	1977/07/15	12:00	MSG	14	0:	457	148	Z,T
01335	(28.88,	-85.67)	1979/08/08	06:00	MSG	14	0:	174	170	Z,T
01336	(28.40,	-85.24)	1977/10/29	00:00	CTD	12	60:	82	180	Z,T,S,C
01337	(28.97,	-85.38)	1977/10/30	00:00	CTD	6	20:	30	90	Z,T,S,C
01338	(28.97,	-85.38)	1977/11/08	00:00	CTD	6	40:	50	83	Z,T,S,C
01339	(28.40,	-85.25)	1977/11/10	00:00	CTD	12	0:	22	180	Z,T,S,C
01340	(28.40,	-85.25)	1977/11/09	00:00	CTD	3	0:	4	38	Z,T,S,C
01341	(28.00,	-85.95)	1978/11/21	13:00	MSG	8	0:	451	906	Z,T
01342	(28.57,	-84.34)	1978/02/11	00:00	CTD	2	15:	18	30	Z,T,S,C
01343	(28.57,	-84.34)	1978/02/13	00:00	CTD	2	15:	18	30	Z,T,S,C
01344	(28.57,	-84.34)	1978/02/09	00:00	CTD	2	15:	18	30	Z,T,S,C
01345	(28.57,	-84.34)	1978/02/08	00:00	CTD	2	0:	3	30	Z,T,S,C
01346	(28.57,	-84.34)	1978/02/12	00:00	CTD	2	0:	3	30	Z,T,S,C
01347	(28.57,	-84.34)	1978/02/10	00:00	CTD	3	0:	6	30	Z,T,S,C
01348	(28.50,	-84.95)	1977/10/29	00:00	CTD	6	0:	10	90	Z,T,S,C
01349	(28.48,	-84.34)	1977/10/28	00:00	CTD	2	10:	12	45	Z,T,S,C
01350	(28.65,	-83.10)	1977/10/15	14:20	CTD	5	2:	10	5	Z,T,S,C
01351	(28.65,	-83.09)	1977/10/15	16:55	CTD	7	0:	12	5	Z,T,S,C
01352	(28.11,	-80.11)	1979/01/29	18:18	STD	7	0:	23	100	Z,T,S,C
01353	(28.90,	-80.66)	1977/02/20	06:12	BOT	2	0:	10	100	Z,T,S,C
01354	(28.91,	-80.43)	1977/02/20	09:30	BOT	3	0:	18	100	Z,T,S,C
01355	(28.85,	-80.03)	1977/02/20	17:48	BOT	8	0:	123	200	Z,T,S,C
01356	(28.83,	-80.21)	1977/02/20	13:54	BOT	5	0:	40	100	Z,T,S,C
01357	(28.15,	-80.13)	1978/03/24	06:00	MSG	4	0:	40	42	Z,T
01358	(28.95,	-80.13)	1978/03/28	06:00	MSG	6	0:	70	100	Z,T
01359	(28.43,	-80.65)	1978/03/31	07:10	MSG	4	0:	49	0	Z,T
01360	(28.47,	-80.72)	1979/07/18	06:00	MSG	14	0:	232	21	Z,T
01361	(28.03,	-80.33)	1978/10/23	16:00	MSG	10	0:	335	20	Z,T
01362	(28.50,	-80.03)	1977/10/25	12:00	MSG	11	0:	329	132	Z,T
01363	(28.75,	-80.50)	1978/10/29	13:00	MSG	14	0:	457	43	Z,T
01364	(28.32,	-80.22)	1977/11/01	12:00	MSG	7	0:	212	22	Z,T
01365	(29.28,	-94.47)	1977/07/25	02:00	MSG	12	0:	759	5	Z,T
01366	(29.98,	-94.27)	1977/08/18	00:00	MSG	12	0:	451	0	Z,T
01367	(29.66,	-93.56)	1979/01/09	21:45	CTD	2	7:	8	5	Z,T,S,C
01368	(29.66,	-93.52)	1979/01/09	23:10	CTD	2	2:	4	5	Z,T,S,C
01369	(29.63,	-93.46)	1979/01/10	00:00	CTD	2	7:	8	5	Z,T,S,C
01370	(29.67,	-93.47)	1979/01/10	01:15	CTD	2	7:	8	5	Z,T,S,C
01371	(29.70,	-93.47)	1979/01/10	02:10	CTD	2	7:	8	5	Z,T,S,C
01372	(29.67,	-93.42)	1979/01/10	02:50	CTD	2	7:	8	5	Z,T,S,C
01373	(29.67,	-93.37)	1979/01/10	03:40	CTD	2	2:	4	5	Z,T,S,C
01374	(29.67,	-93.37)	1979/06/02	04:34	CTD	2	1:	4	5	Z,T,S,C
01375	(29.50,	-93.19)	1979/06/02	06:08	CTD	2	11:	12	5	Z,T,S,C
01376	(29.66,	-93.56)	1979/06/02	02:00	CTD	2	6:	8	5	Z,T,S,C
01377	(29.66,	-93.52)	1979/06/02	02:41	CTD	2	1:	4	5	Z,T,S,C
01378	(29.70,	-93.47)	1979/06/02	03:17	CTD	2	1:	4	5	Z,T,S,C
01379	(29.67,	-93.42)	1979/06/02	03:56	CTD	2	1:	4	5	Z,T,S,C
01380	(29.67,	-93.47)	1979/06/01	22:00	CTD	2	6:	8	5	Z,T,S,C
01381	(29.67,	-93.47)	1979/06/01	22:30	CTD	2	6:	8	5	Z,T,S,C
01382	(29.67,	-93.47)	1979/06/01	23:00	CTD	2	1:	4	5	Z,T,S,C
01383	(29.67,	-93.47)	1979/06/01	23:30	CTD	2	1:	4	5	Z,T,S,C
01384	(29.67,	-93.47)	1979/06/02	00:00	CTD	2	6:	8	5	Z,T,S,C

Sample Output List

```
      PROGRAM DBMS_MOODS

      DIMENSION DATA(4,1000)

      OPEN(UNIT=10,FILE='NEW_MOODS.DAT',FORM='FORMATTED',
     1     STATUS='UNKNOWN')
      WRITE (6,90)
90    FORMAT (1H1,///3X,'DATA FILE : MOODS_GOM_01'//)

      INIT = 0
      IREC = 0

      DO  WHILE (INIT.NE.9)

      IREC = IREC + 1

      CALL  READ_MOODS
     1 (INIT,
     2  XLAT,XLONG,IDATE,ITIME,INSTRU,NLEV,NPAR,NCRUSE,IENDEP,IBATHY,
     3  DATA)

      CALL BREAKD
     1 ( IDATE, ITIME, INSTRU,
     2   IYEAR, IMONTH, IDAY, IHOUR, IMIN, ICODE, ISORCE )

      WRITE (6,100) IREC,IYEAR,IMONTH,IDAY,IHOUR,IMIN,ICODE,ISORCE
100   FORMAT (I6.5,I6,2('/',I2.2),2X,I2.2,':',I2.2,2I4)

      WRITE (10,110)
     1  XLAT,XLONG,IDATE,ITIME,INSTRU,NLEV,NPAR,NCRUSE,IENDEP,IBATHY
110   FORMAT (2F8.2,3I8,I6,I2,3I8,8X)

      NPAR1=NPAR+1
      IF(NPAR1 .GT. 4) GOTO 117
      DO 115 J=1,NLEV
      DO 115 I=NPAR1,4
115   DATA(I,J)=99999.99
117   WRITE (10,120) ((DATA(I,J),I=1,NPAR),J=1,NLEV)
120   FORMAT (2(F10.0,3F10.2))

      END DO

      WRITE (6,130) IREC
130   FORMAT (//3X,'TOTLAL NUMBER OF RECORD IS',I6///)

      STOP
      END

      INCLUDE 'READ_MOODS.FOR'
      INCLUDE 'BREAKD.FOR'
```

Program to Read MOODS Data

```
      SUBROUTINE SOUND(T,SAL,PRES,SVEL)
C     REVISED PRESSURE CONVERSION JHO
C     REFERENCE - WILSON, W.D.,1960, EQUATION FOR THE SPEED OF
C     SOUND IN SEA WATER, JOUR. ACOUST. SOC. AMER., 32(13),1357.
C
C     PRES= PRESSURE IN DECIBARS FROM SEA SURFACE .
C     P = TOTAL PRESSURE IN KG/CM2 ABSOLUTE .
C     SAL = SALINITY IN PARTS PER 1000 .
C     T = TEMPERATURE IN DEGREES CELSIUS .
C     SOND = SOUND VELOCITY IN METERS PER SECOND .
C
      P = (PRES + 10.1325) * 0.1019716
      S = SAL -35.
C
      VT = T*(4.5721+T*(-4.4532E-2+T*(-2.6045E-4+7.9851E-6)))
      VS = S*(1.39799+1.69202E-3*S)
      VP = P*(0.160272+P*(1.0268E-5+P*(3.5216E-9-3.3603E-12*P)))
C
      VSTP = S*(T*(-1.1244E-2+7.7711E-7*T)+P*(7.7016E-5-1.2943E-7*P+
     1 T*(3.1580E-8+1.5790E-9*T)))+
     2 P*(T*(-1.8607E-4+T*(7.4812E-6+4.5283E-8*T)))+
     3 P*P*(T*(-2.5294E-7+1.8563E-9*T-1.9646E-10*P))
C
      SOND = 1449.14 + VT + VP + VS + VSTP
C
      SVEL = SOND
      RETURN
      END
```

Subroutine Program Used to Compute Sound Speed

AREA COORDINATES
LOWER LEFT 15.000 -98.000 UPPER RIGHT 31.000 -80.000

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	PRCNT
1977	25	54	27	10	17	19	228	10	12	142	58	35	637	33.5
1978	43	74	67	89	28	44	50	90	47	46	173	41	792	41.7
1979	31	32	49	36	78	64	43	54	27	34	9	15	472	24.8
TOTAL	99	160	143	135	123	127	321	154	86	222	240	91	1901	
PRCNT	5.2	8.4	7.5	7.1	6.5	6.7	16.9	8.1	4.5	11.7	12.6	4.8		100.0

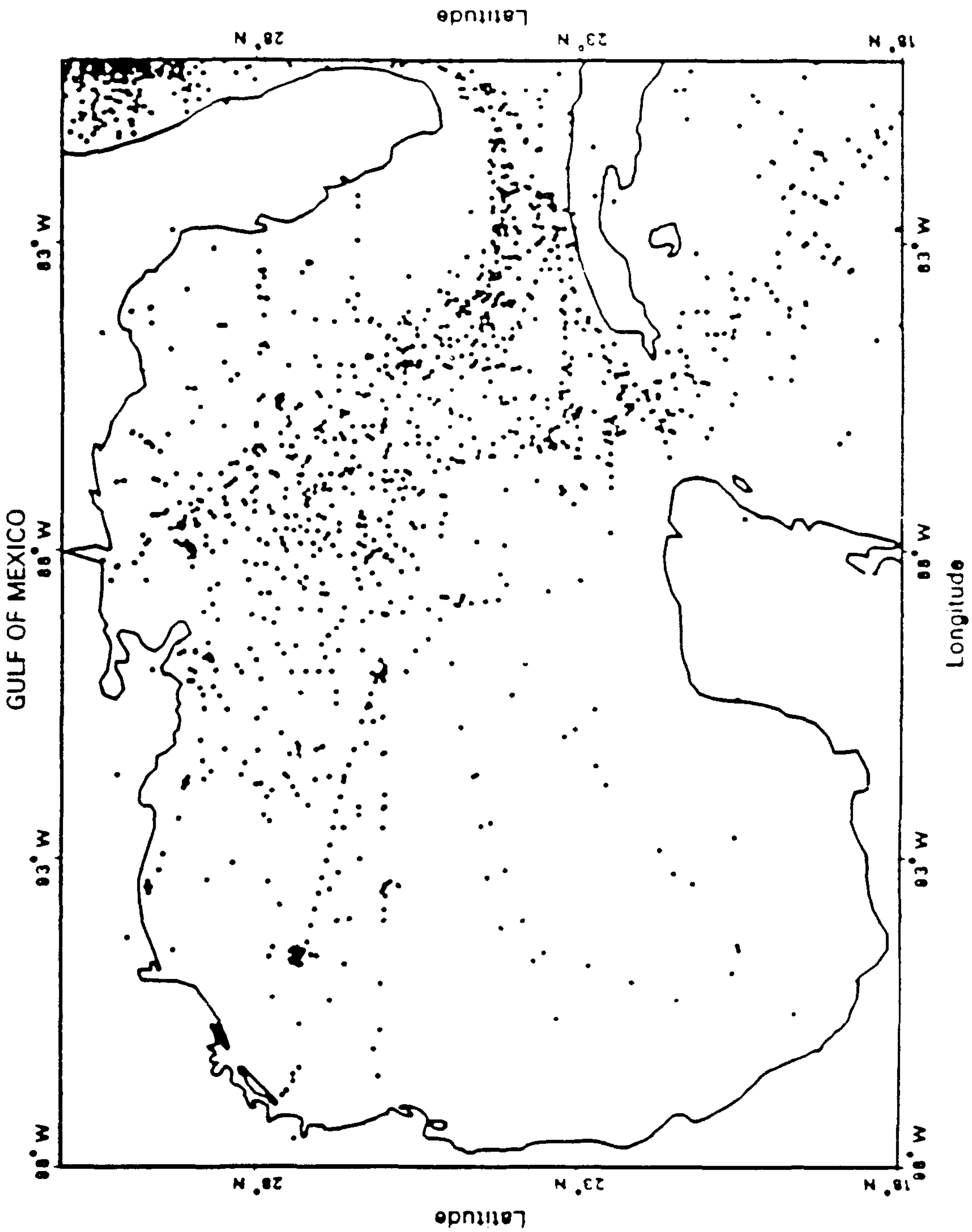
PRESS TRANSMIT (OR RETURN) KEY TO CONTINUE
>

COUNTS BY MOODS SOURCE NUMBER (SOURCE NUMBER-COUNT)
2- 1310 4- 45 8- 5 11- 28 22- 487 34- 26

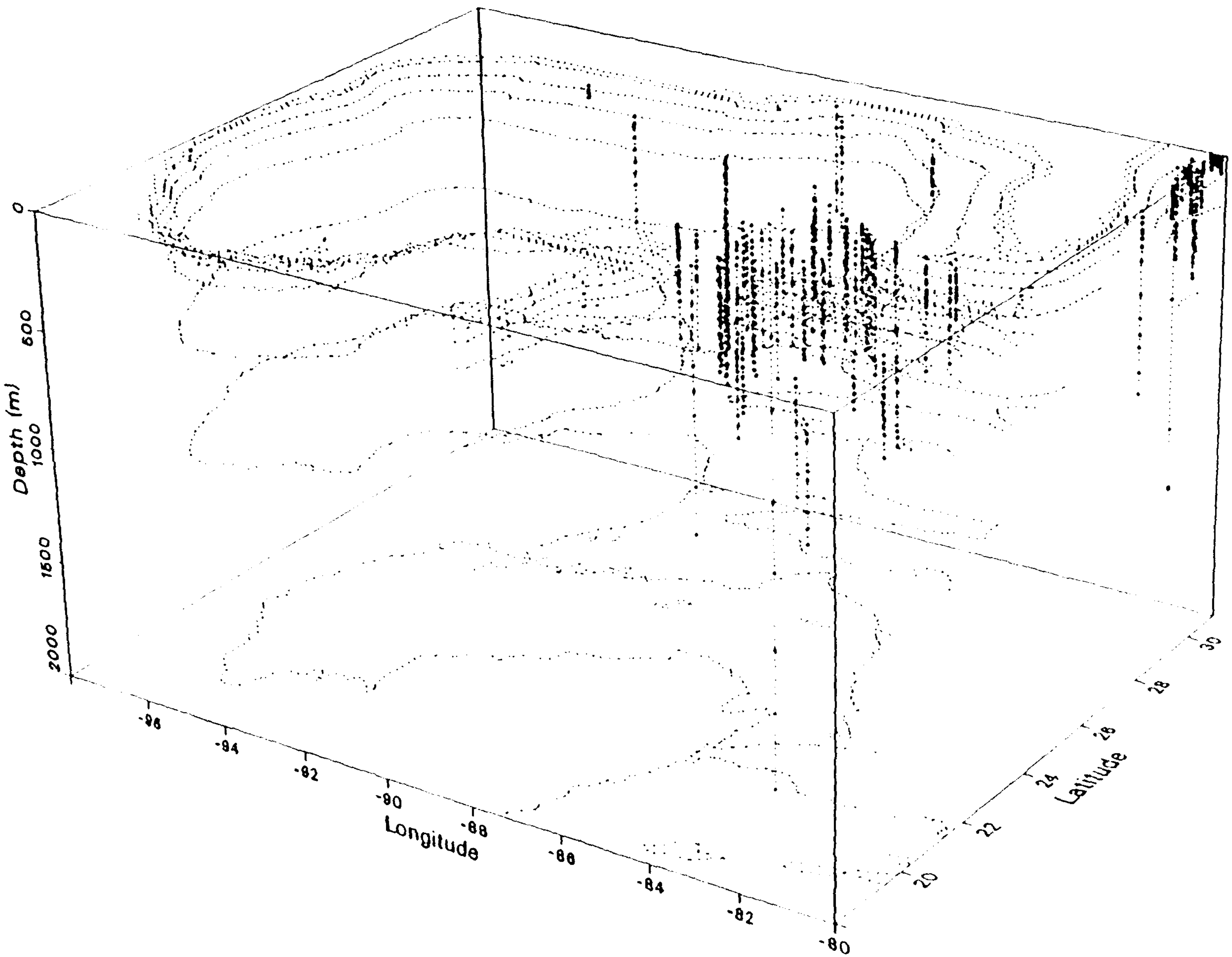
COUNTS BY MOODS INSTRUMENT NUMBER (INSTRUMENT NUMBER-COUNT)
0- 28 1- 1310 11- 31 25- 44 31- 1 33- 487

COUNTS BY CLASSIFICATION (CLASSIFICATION CODE-COUNT)
1- 1901

Summary of MOODS (1977-1979)



Distribution of MOODS (1977 1979)



The MOODS Casts in April 1978

Instrument Code

Code	Instrument
0	unknown instrument
1	message data (regardless of instrument)
2	mechanical bathythermograph (MBT)
10	some unknown electronic temperature depth instrument
11	expendable bathythermography (XBT)
12	air deployed expendable bathythermography (AXBT)
13	submarine deployed expendable bathythermograph (SXBT)
14	helicopter deployed expendable bathythermograph (HXBT)
15	expendable sound velocity profiler (XSV)
17	submarine deployed expendable sound velocity profile (SXSV)
25	hydrocast: bottles and reversing thermometers
30	some unknown electronic salinity, temperature, depth instruments
31	salinity, temperature, depth probe (STD)
32	STD with bottles, reversing thermometers
33	conductivity, temperature, depth probe, (CTD)
34	CTD with bottles, reversing thermometers
* 39	temperature, salinity microstructure profiler
* 40	some unknown current profile instrument
* 60	some unknown optical profile instruments

*Not part of initial system

SOURCE CODES

(For sources 1 through 35 see "Functional Description MOODS," REV. 1985, by R. Bauer, Compass Systems, Inc., San Diego, CA

CODE	SOURCE	
1	MBT100/CSI30M	
2	FNOC message data	
3	NODC MBT - through 31 October 1976	
4	NODC SDII - through 1980	
5	FNOC SPOT XBT	
6	FNOC EDIT	
7	NODC STD	
8	British - through July 1978	
9	NODC MBT Card Image Format	
10	NODC XBT Format - through 1980	
11	Japanese MBT/XBT	
12	Lamont XBTs	
13	NMFS SWFC XBT Format	
14	Argentine and Japanese Inflection Point Profiles	
15	NODC SDI Format - through 1978	
16	New French Data Set	
17	Korean File	
18	Standard Level Japanese Data	
19	Foster Data - through 1976	
20	Old French Data Set - through 1967	
21	Norway Data Set - through 1967	
22	Krunch (NODC file 022)	
23	Emery STD	
24	Hawaii Shuttle	
25	NODC UBT Format	
26	Monterey Bay HYDAT - through 1978	
27	Oregon State, Newport Line - through 1975	
28	NAVOCEANO XBT	
29	NAVOCEANO CTD	
30	NAVOCEANO STD	
31	Japanese Fisheries	
32	California Fish & Game Survey	
33	Noumea Data Set	
34	SIO Composit	
35	NAVOCEANO XBT-Two	
-----The above	sources were processed by MOODS	not MUMS----
65	NODC UBT Format	processed by MUMS
66	NODC 022	processed by MUMS
67	NAVOCEANO XBT	processed by MUMS
68	NAVOCEANO CTD	processed by MUMS

APPENDIX D

GEOSAT USER GUIDE

APPENDIX D

geosat.usersguide

DRAFT DRAFT DRAFT DRAFT

INO Users Guide for GEOSAT SSH

A. Introduction

I. General information (what missions, who owns, who controlls)
II. Details of orbits (date of start, what orbits, what periodicity)

B. The original data set

I. Origin (who calculated the ephemeris and how)
II. Details of data (description of variables)

C. Processing by ADAPA

I. Outlier rejection (description of procedure)
II. Orbit error reduction (description of procedure)
III. Calculation of mean SSH and geoid for regions (description of procedure)
IV. Calculation of time dependent SSH for regions (description of procedure)

D. The available data sets

I. Global orbit error reduced
  a. Files (names convention and correspondence eg. a file for each day)
  b. Description of data:
    1. Time (xxx.y sec since 1 Jan 1970)
    2. Latitude (xx.yy in deg)
    3. Longitude (xx.yy in deg)
    4. SSH (xxxx in cm)

II. Regional mean SSH and geoid
  a. Files (name convention and correspondence)
  b. Description of data:
    1. Latitude
    2. Longitude
    3. Mean SSH
    4. Standard deviation of mean SSH
    5. Geoid
    6. Standard deviation of geoid

III. Regional time dependant SSH
  a. Files (names convention and correspondence)
  b. Description of data:
    1. Time (xxx.y sec since 1 Jan 1970)
    2. Latitude (xx.yy in deg)
    3. Longitude (xx.yy in deg)
    4. SSH (xxxx in cm)
    5. Standard deviation of SSH (xxx.y)

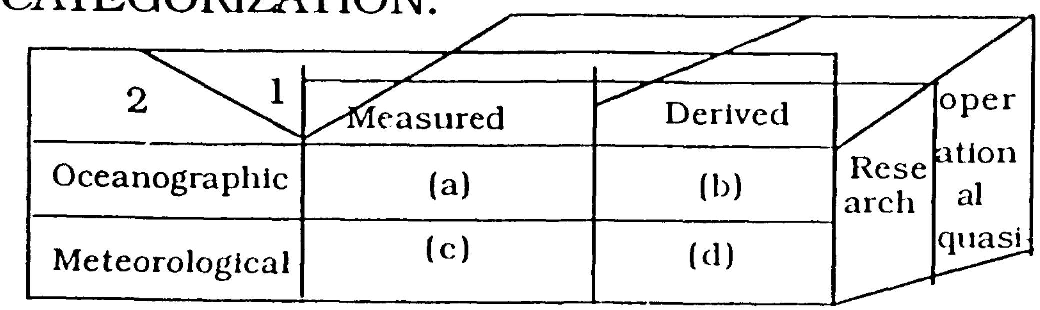
APPENDIX E

INO DATA LIBRARY DESIGN

10 MAJOR CATEGORIES*

(0) CLIMATOLOGY
(1) MEASURED RESEARCH OCEANOGRAPHIC DATA
(2) MEASURED (QUASI-) OPERATIONAL OCEANOGRAPHIC DATA
(3) MEASURED RESEARCH METEOROLOGICAL DATA
(4) MEASURED OPERATIONAL METEOROLOGICAL DATA
(5) DERIVED RESEARCH OCEANOGRAPHIC DATA
(6) DERIVED (QUASI-) OPERATIONAL OCEANOGRAHIC DATA
(7) DERIVED RESEARCH METEOROLOGICAL DATA
(8) DERIVED (QUASI-) OPERATIONAL METEOROLOGICAL DATA
(9) SYNTHETIC DATA

CATEGORIZATION:



CLIMATOLOGY, SYNTHETIC

SAMPLE

DATA BASE/DATA LIBRARY CATALOG

Source/Reference	Data Type \ Physical Variables	T(z)	SST	S(z)	SSH	$\vec{V}(z)$	Wind
INO/Sirkes	GEOSAT Altimetry				x		
NCAR/Levitus	Climatology	x		x			
NCAR/Hellerman							x
FNOC	SPOT	x	x	x			x
NOAA/MCSST	IR Imagery		x				

DISTRIBUTION LIST

1. Office of Naval Research
   Code 120M
   800 North Quincy Street
   Arlington, VA 22217-5000

2. Technical Director
   Office of Naval Research (Code 10)
   800 North Quincy Street
   Arlington, VA 22217-5000

3. Technical Director
   Office of Naval Research (Code 20)
   800 North Quincy Street
   Arlington, VA 22217-5000

4. Oceanographer of the Navy
   U.S. Naval Observatory
   34th & Massachusetts Ave.
   Washington, DC 20392

5. Space and Naval Warfare System
   Command (PMW 141)
   Washington, DC 20363

6. Commanding Officer
   NOARL (Code 100)
   Stennis Space Center, MS 39529

7. Technical Director
   NOARL (Code 110)
   Stennis Space Center, MS 39529

8. Director, Ocean Sciences
   Directorate
   NOARL (Code 300)
   Stennis Space Center, MS 39529

9. Head, Ocean Sensing and
   Prediction Division
   NOARL (Code 320)
   Stennis Space Center, MS 39529

10. Director, Atmospheric Sciences
    Directorate
    NOARL West (Code 400)
    Monterey, CA 93943-5000

11. Commanding Officer
    Fleet Numerical Oceanography
    Office
    Monterey, CA 93943-5000

12. Commanding Officer
    Naval Oceanographic Office
    Stennis Space Center, MS 39529

13. Technical Director
    CNOC (Code OOT)
    Stennis Space Center, MS 39529

14. Library
    NOARL (Code 125)
    Stennis Space Center, MS 39529

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. Agency Use Only *(Leave blank).*

2. Report Date. July 1990

3. Report Type and Dates Covered. Special Project

4. Title and Subtitle.
Progress on Data Accession and Preparation of User's Guides

5. Funding Numbers.
Program Element No. 0602435N
Project No. 03584
Task No. 803
Accession No. DN250023

6. Author(s).
C. Aaron Lai

7. Performing Organization Name(s) and Address(es).
Institute for Naval Oceanography
Stennis Space Center, MS 39529-5005

8. Performing Organization Report Number.
INO Special Project - 3

9. Sponsoring/Monitoring Agency Name(s) and Address(es).
Office of Naval Research
800 North Quincy Street
ONR Code 120M
Arlington, VA 22217

10. Sponsoring/Monitoring Agency Report Number.

11. Supplementary Notes.

12a. Distribution/Availability Statement.
Approved for public release; distribution is unlimited.

12b. Distribution Code.

13. Abstract *(Maximum 200 words).*

INO's progress on data accession for use in model experiments and evaluation under the Experimental Center for Mesoscale Ocean Prediction (ECMOP) Project is described. Also discussed is the status of the preparation of user's guides for climatology, hurricane MOODS, and GEOSAT data, as well as the design of an INO data library.

14. Subject Terms.
(U) INO (U) ECMOP (U) DATA (U) USER'S GUIDES

15. Number of Pages. 45

16. Price Code.

17. Security Classification of Report. Unclassified

18. Security Classification of This Page. Unclassified

19. Security Classification of Abstract. Unclassified

20. Limitation of Abstract. SAR