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SENSITIVITY STUDY OF CFAS AND CFAR OBJECTIVE ANALYSIS TECHNIQUE--ETC(U)

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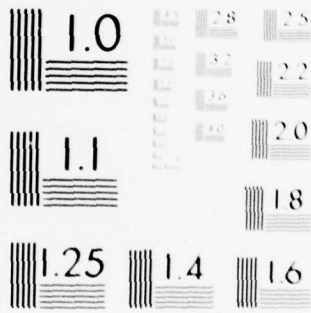
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SENSITIVITY STUDY OF CFAS AND CFAR OBJECTIVE ANALYSIS TECHNIQUES

FEBRUARY 1979

Prepared by

**W. D. MOUNT, B. R. FOW
B. D. MOUNT and J. O. RAPP
Geo-Atmospherics Corporation**

Box 177
Lincoln, Massachusetts 01773

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The Cloud/Fog Analysis System (CFAS) and the Cloud/Fog Application Routines (CFAR) were applied to weather data bases to determine their sensitivity to control parameters and to type, density, and distribution of observing stations. The data rich region of southeastern United States was selected and hourly aviation weather (Service A), six-hourly synoptic (Service C), and twelve-hourly radiosonde (RAOB) observations were collected for weather scenarios of interest to Army aviation. Computer methods were developed to process these data and convert them into a form suitable for CFAS. Objective analyses and output displays were generated using CFAS and CFAR, respectively, on such weather variables as sky cover, lowest cloud base, ceiling, visibility, significant present weather, and cloud obscuration to pilot's vision within discrete flight layers. Results, produced from large variations in the computer control parameters and density and distribution of stations, were used to modify the CFAS and CFAR to correct for detected errors and to fix the control parameters so that users are now relieved of that responsibility. This greatly simplifies the knowledge and experience required to execute CFAS. A large number of color-coded displays was generated to demonstrate feasibility, skill, and detail that is possible with an automated meteorological system in providing weather information tailored to Army user needs.

TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
1	INTRODUCTION	12
1.1	GENERAL	12
1.1.1	<u>Overview</u>	12
1.1.2	<u>Background</u>	14
2	WEATHER DATA BASES	23
2.1	DATA AND ANALYSIS WINDOWS	23
2.2	SERVICE A - HOURLY WEATHER	26
2.2.1	<u>Station Location and Characteristics</u>	26
2.2.2	<u>Aviation Weather Code and Data Used</u>	30
2.3	SERVICE C - SYNOPTIC WEATHER	36
2.3.1	<u>Station Location and Characteristics</u>	36
2.3.2	<u>SYNOP Weather Code and Data Used</u>	39
2.4	RADIOSONDE - UPPER AIR DATA	42
2.4.1	<u>Station Location and Characteristics</u>	42
2.4.2	<u>RAOB Weather Code and Data Used</u>	44
2.5	VARIABLE STATION DENSITY DISTRIBUTION	50
2.6	SELECTED WEATHER SEQUENCES	66
2.7	DATA ENTRY PROCEDURES	79

TABLE OF CONTENTS (Continued)

<u>Section</u>		<u>Page</u>
3	UTILITY PROGRAMS	85
3.1	PURPOSE AND DESCRIPTION	85
3.1.1	<u>Program COLUMN</u>	86
3.1.2	<u>Program CONVER</u>	87
3.1.3	<u>Program SYNOP</u>	88
3.1.4	<u>Program AIRWAY</u>	89
3.1.5	<u>Program .NEWUTM</u>	90
3.1.6	<u>Program .CFMAIN/STAT1</u>	91
3.1.7	<u>Program .INTPRT</u>	92
3.1.8	<u>Program .OBSTIM</u>	93
3.1.9	<u>Program .STDENS</u>	94
3.1.10	<u>Program .CFMAIN/IJFL</u>	95
3.1.11	<u>Program .CFMAIN/TSK3RI</u>	96
3.1.12	<u>Program .CFSTAT</u>	97
4	CFAS SENSITIVITY ANALYSIS	98
4.1	ALL DATA ANALYSES	98
4.1.1	<u>CFAS Control Parameter Effects</u>	98
4.2	VARIABLE DATA DENSITY ANALYSES	106
4.2.1	<u>Correlations and RMS Errors</u>	106

TABLE OF CONTENTS (Continued)

<u>Section</u>		<u>Page</u>
4.3	SILENT AREA ANALYSES	119
5	ARMY AVIATION WEATHER DEMONSTRATION MATERIAL	127
5.1	MAP DISCUSSION OF RESULTS	127
6	RESULTANT MODIFICATIONS OF CFAS-CFAR PROGRAM ELEMENTS	168
6.1	SUMMARY	168
6.1.1	<u>FORTTRAN PROC .BASE</u>	168
6.1.2	<u>Main Program .CFMAIN/DSK</u>	169
6.1.3	<u>Subprogram .CFMAP</u>	171
6.1.4	<u>Subprogram .COMOBR</u>	172
6.1.5	<u>Subprogram .EXEC1</u>	172
6.1.6	<u>Subprogram .EXEC2</u>	173
6.1.7	<u>FORTTRAN PROC .GRDPOINTALT</u>	173
6.1.8	<u>Subprogram .SFDINT</u>	173
6.1.9	<u>Subprogram .SHADE</u>	174
7	CONCLUSIONS AND RECOMMENDATIONS	175
8	APPENDICES	178
8.1	UTILITY PROGRAM LISTINGS	178
8.2	LISTINGS OF REVISED CFAS-CFAR PROGRAM ELEMENTS	229

ILLUSTRATIONS

2.1	Map Showing the Outer (900 km) and Inner (500 km) Data Acceptance and Analysis Square, Respectively	24
2.2	Topographic Map of Inner (500 km) Analysis Square	25
2.3	Service A Station Locations	29
2.4	Service A Teletype Transmitted Report	31
2.5	Coded Service A Transmission Example	32
2.6	Service C Station Locations	38
2.7	Symbolic Primary Synoptic Report	39
2.8	Service C Teletype Transmission	40
2.9	RAOB Station Location	43
2.10	Symbolic Form of Radiosonde Message	46
2.11	RAOB Teletype Transmitted Report (Parts A & B)	49
2.12	Full Station Density	53
2.13	3/4 Station Density	54
2.14	1/2 Station Density	55
2.15	1/4 Station Density	56
2.16	1/8 Station Density	57
2.17	1/16 Station Density	58
2.18	Silent Area Stations	59
2.19	3/4 Station Density by Objective Technique	63
2.20	Weather Map 1640Z February 26, 1977	70

ILLUSTRATIONS (Continued)

2.21	Weather Map 2120Z February 26, 1977	71
2.22	Weather Map 0000Z February 27, 1977	72
2.23	Weather Map 0340Z February 27, 1977	73
2.24	Weather Map 0510Z February 27, 1977	74
2.25	Weather Map 0640Z February 27, 1977	75
2.26	Weather Map 0720Z February 27, 1977	76
2.27	Weather Map 0810Z February 27, 1977	77
2.28	Weather Map 0026Z March 7, 1977	78

ILLUSTRATIONS (Continued)

4.1	Missing Grid Point Analyses Vs. Station Density	107
4.2	Sky Cover Correlation Vs. Station Density	111
4.3	Visibility Correlation Vs. Station Density	112
4.4	Ceiling Correlation Vs. Station Density	113
4.5	Present Weather Vs. Station Density	114
4.6	Sky Cover RMSE Vs. Station Density	115
4.7	Visibility RMSE Vs. Station Density	116
4.8	Ceiling RMSE Vs. Station Density	117
4.9	Present Weather RMSE Vs. Station Density	118
4.10	Silent Area Grid Point Error Values for Sky Cover (Percent)	120
4.11	Silent Area Grid Point Error Values for Lowest Cloud (Kilometers)	121
4.12	Silent Area Grid Point Error Values for Visibility (Kilometers)	122

ILLUSTRATIONS

5.1	Typically Difficult to Read Teletype Weather Report	128
5.2	Topography and Geo-Political Features	130
5.3	Sky Cover 2130Z 26 Feb 1977 Computer Analysis	137
5.4	Sky Cover 0040Z 27 Feb 1977 Computer Analysis	138
5.5	Sky Cover 0340Z 27 Feb 1977 Computer Analysis	139
5.6	Sky Cover 0510Z 27 Feb 1977 Computer Analysis	140
5.7	Sky Cover 0640Z 27 Feb 1977 Computer Analysis	141
5.8	Lowest Cloud Base 0040Z 27 Feb 1977 Computer Analysis	142
5.9	Lowest Cloud Base 0340Z 27 Feb 1977 Computer Analysis	143
5.10	Lowest Cloud Base 0510Z 27 Feb 1977 Computer Analysis	144
5.11	Lowest Cloud Base 0640Z 27 Feb 1977 Computer Analysis	145
5.12	Ceiling 0040Z 27 Feb 1977 Computer Analysis	146
5.13	Ceiling 0340Z 27 Feb 1977 Computer Analysis	147
5.14	Ceiling 0510Z 27 Feb 1977 Computer Analysis	148
5.15	Ceiling 0640Z 27 Feb 1977 Computer Analysis	149
5.16	Visibility 0040Z 27 Feb 1977 Computer Analysis	150
5.17	Visibility 0340Z 27 Feb 1977 Computer Analysis	151
5.18	Visibility 0510Z 27 Feb 1977 Computer Analysis	152
5.19	Visibility 0640Z 27 Feb 1977 Computer Analysis	153
5.20	Present Weather 0040Z 27 Feb 1977 Computer Analysis	154

ILLUSTRATIONS (Continued)

5.21	Present Weather 0340Z 27 Feb 1977 Computer Analysis	155
5.22	Present Weather 0510Z 27 Feb 1977 Computer Analysis	156
5.23	Present Weather 0640Z 27 Feb 1977 Computer Analysis	157
5.24	Present Weather 0720Z 27 Feb 1977 Computer Analysis	158
5.25	Sky Cover 0640Z 27 Feb 1977 Computer Analysis	159
5.26	Lowest Cloud Base 0640Z 27 Feb 1977 Computer Analysis	160
5.27	Ceiling 0640Z 27 Feb 1977 Computer Analysis	161
5.28	Visibility 0640Z 27 Feb 1977 Computer Analysis	162
5.29	Present Weather 0640Z 27 Feb 1977 Computer Analysis	163
5.30	Cloud Cover, Surface to 45 m AGL Layer, 0820Z 27 Feb 1977 Computer Analysis	164
5.31	Cloud Cover, 45 to 91 m AGL Layer, 0820Z 27 Feb 1977 Computer Analysis	165
5.32	Cloud Cover, 91 to 183 m AGL Layer, 0820Z 27 Feb 1977 Computer Analysis	166
5.33	Cloud Cover, 183 to 305 m AGL Layer, 0820Z 27 Feb 1977 Computer Analysis	167

TABLES

1.1	Elements of the Cloud Fog Data Base (CFDB)	16
1.2	Weather Related CFAS Input Parameters	18
2.1	Service A Station Information	27
2.2	Summary of Sky Cover Designators	33
2.3	Weather and Obstruction to Vision Symbols	35
2.4	Service C Station Information	37
2.5	Definition of SYNOP Code Symbols	41
2.6	Radiosonde Station Information	44
2.7	Definition of Radiosonde Code Symbols	48
2.8	Station Densities Used in CFAS Sensitivity Analysis	52
2.9	Full Station Density	60
2.10	3/4 Station Density	61
2.11	1/2 Station Density	61
2.12	1/4 Station Density	62
2.13	1/8 Station Density	62
2.14	1/16 Station Density	62
2.15	3/4 Station Density by Objective Technique	64
2.16	Format for Fast Entry of Service A Air Data	81
2.17	Format for Fast Entry of Service C Synoptic Data	83
2.18	Format for Fast Entry of Radiosonde Data	84

TABLES (Continued)

4.1	CFAS Parameter Values and Variations	99
4.2	Results Using Variable CFAS Control Parameters	101
4.3	Silent Area Goodness of Fit Values	125
6.1	Input Data Stream for CFAS TASK 3	170

1 INTRODUCTION

1.1 GENERAL

1.1.1 Overview

The Army has more aircraft and pilots than the Air Force, flies most missions in weather sensitive light displacement aircraft at low altitudes over short distances and times, and yet provides the least amount of meteorological training for its pilots. It is not unusual that Army pilots have considerable difficulty and are error prone in reading and properly interpreting weather codes for aviation, synoptic, radiosonde, and pilot report observations. The present standard weather teletype sequences do not make the pilot's job easy. They have to memorize the weather station call letter and numbers, rummage through clip boards to search for particular stations and time changes of weather, and attempt to assimilate the four-dimensional distribution of weather important to his flight. The labor-saving and real-time accurate analyses of weather by a computer based Automatic Meteorological System (AMS) offers considerable potential and value to the Army Aviation Community.

As a part of the AMS program, the Geo-Atmospherics Corporation (GAC) developed the Cloud/Fog Analysis System (CFAS) to take any type and age of meteorological observation and perform an objective analysis

to specify each weather variable on a three-dimensional array of grid points. This cloud-fog data base (CFDB) generated by CFAS can be used individually or its parts analyzed to tailor operational products to a given application. The Geo-Atmospherics Corporation developed several Cloud-Fog Application Routines (CFAR) to interrogate the CFAS data base, extract, analyze, and display a map of each chosen parameter, i.e. sky cover, ceiling, visibility, cloud base, cloud top, significant weather, and cloud amounts within nine different layers extending from the surface to the 3,000 meter altitude.

This study was conducted to determine the sensitivity of the Cloud Fog Analysis System (CFAS) and the Cloud Fog Application Routines (CFAR) to type and distribution of observations, to select suitable CFAS control parameters for routine use, and to perform a series of computer runs on weather scenarios to demonstrate potential benefits of weather automation to Army aviation.

1.1.2 Background

The CFAS/CFAR is a computer software package of several inter-related subprograms coded in the language of FORTRAN V. The CFAS/CFAR was designed to be one of the subsystems of the U.S. Army's Automatic Meteorological System (AMS). The function of the CFAS is to create and maintain a cloud-fog data base (CFDB) in near real-time on a square grid covering a user-specified geographical area relocatable anywhere in the world. The CFAR then utilizes the CFDB to generate on demand, products useful in Army aviation operations. CFAR products currently developed include two-dimensional depictions of areas of critical visibilities on the ground, ceilings, and severe convective activity.

The data sources which the CFAS objectively analyzes and from which the CFDB is generated include:

1. Selected elements from scheduled teletype network transmissions of surface and upper air observations such as AIRWAYS, SYNOP, METAR and RADIOSONDE coded messages.
2. The three-hour prognosis of layered cloud cover produced by the Air Force Global Weather Central's Three Dimensional Nephanalysis Model.

3. Elements of non-scheduled and special weather reports
corresponding to elements in either of the above sources.

The CFDB consists of the elements listed in Table 1.1 specified at each grid point in a horizontal window 500 km on a side. The grid points are spaced 25 km apart.

TABLE 1.1 Elements of the Cloud Fog Data Base (CFDB)

<u>Element</u>	<u>Units</u>
Total sky cover	00 - 100 Percent
Height of ceiling layer	dekameters, AGL* (minus if a variable ceiling)
Prevailing visibility at surface	meters (minus if variable)
Base height of lowest cloud	dekameters, AGL
Top height of highest cloud	dekameters, AGL
Present weather	WMO** code 4677

Percent cloud cover in the following layers:

0 - 49	meters, AGL
50 - 99	" "
100 - 199	" "
200 - 299	" "
300 - 599	" "
600 - 999	" "
1000 - 1499	" "
1500 - 1999	" "
2000 - 3000	" "

*AGL - above ground level

**WMO - World Meteorological
Organization

Previous work on CFAS and CFAR was directed toward an engineering solution to insure "working" models and computer programs for analyzing and applying cloud/fog data. Under these conditions, refinements were neither possible, nor required. Also, in order to make the work effort tractable, a decision was made to manually input parameters which control the CFAS and CFAR. Those input parameters that are weather dependent and that were varied in this study are listed in Table 1.2. They include such items as the time to begin an analysis, time of the oldest data to be used, number of possible grid squares to search for observations surrounding a grid point, first search square size that will be interrogated (if no observation exists, second, third, etc., search square size), distance between two or more observations to be combined into one "best report", and distance and time scale factor to allow cellular convective cloud information to be extrapolated differently in space and time than the more strataform middle and high clouds.

TABLE 1.2 Weather Related CFAS Input Parameters

Parameter	Description
TIME	Time of analysis, minutes
TYMOLD	Time of oldest data to be used in analysis, minutes
NSSQ	Number of search squares
ISSQ(1)	Size of first search square, grid units
ISSQ(2)	Size of second search square, grid units
ISSQ(3)	Size of third search square, grid units
ISSQ(4)	Size of fourth search square, grid units
ISSQ(5)	Size of fifth search square, grid units
DSP	Maximum distance between observations which are combined into a best report, Km
DIST(1)	Distance scale factor when only convective clouds are present in a best report, Km
DIST(2)	Distance scale factor when only convective and middle clouds are present in a best report, Km
DIST(3)	Distance scale factor for all other cases, Km
TYMC(1)	Time scale factor when only convective clouds are present in a best report, minutes
TYMC(2)	Time scale factor when only convective and middle clouds are present in a best report, minutes
TYMC(3)	Time scale factor for all other cases, minutes

A 500 km square geographical area within the southeast portion of the United States was selected for analysis and demonstration of the CFAS/CFAR. Three reasons for selecting this area are (1) high data density, (2) variety of weather, and (3) location Army aviation school at Fort Rucker, Alabama. Attempts were made to center the grid window symmetrically about the Army aviation training bases in Alabama. All routine and aperiodic weather reporting stations were identified within the 500 km analysis window region and for an additional 200 km border surrounding that window to insure data distribution in a manner that allows analyses to be performed on the outer boundaries of the window region.

A weather watch was instituted to search for and select synoptic meteorological conditions that provide sequences and scenarios important to Army aviation. Situations depicting deteriorating flight weather conditions received priority. Particular attention was given to those features effecting sky cover, ceiling, visibility, and significant weather events.

Three different synoptic weather sets were selected for the dates December 6 to 8, 1976, February 25 to 27, 1977, and March 5 to 7, 1977. Data included surface observations of hourly aviation weather and six-hourly synoptic data, and upper air observations from radiosonde and

pilot reports. Each data set was examined closely to eliminate errors, minimize missing data, and maximize the number of data sources and inputs. Care was exercised in decoding the weather data and encoding it in a form compatible with the exact input needs of the CFAS/CFAR programs. This data sample was chosen to provide a technical challenge to the CFAS/CFAR system while at the same time depicting features that are operationally interesting to pilots. Several types and changes of weather scenarios were captured to provide a large total data sample which illustrates a wide range of operational flight weather conditions.

Operational performance and quality of information output from CFAS/CFAR was studied to determine sensitivity to type and density of data sources. Test runs were made using maximum amount of all types of data and using every available reporting station. Results from these runs formed the baseline analysis or ground truth for subsequent analyses where data amount and distribution were systematically varied. A comparative analysis was made to determine degradation as a function of increasing sparsity of data. The data sparsity was created in two ways. The first way consisted of withholding data from selected stations in such a manner as to uniformly reduce the density throughout the entire region. The second way consisted of withholding data from stations in

such a manner as to create a subregion of little or no data (silent area) and thus create a nonuniform distribution of data density. This latter case having a silent area is typical of battlefield environments.

The present manually inputted control parameters of CFAS were altered to effect such things as the mesoscale and synoptic scale distance and time constant parameters, cut-off distances for best reports, and number of search squares allowable to find data necessary to analyze and depict a weather value at a grid point. Three methods were imposed to establish a quantitative measure of "goodness of fit" between "ground truth" and analyses by sequentially changing control parameters. The correlation coefficient and root mean square error (RMSE) were computed where the ensemble included all values at every grid point where an analysis was possible. Those grid points where an analysis was not possible were tabulated and a percentage of missing analyses was computed. A total of 16 test runs was made using all available weather observations while only one control parameter was varied at a time. Three different ranges of values were used for seven distance and time control parameters to bracket the expected mean with high and low values. The five search square control parameters were varied to investigate performance versus computer execution time required for an analysis. A fixed predetermined set of instructions was defined for

operating the CFAS and was incorporated in the final operating computer program.

A time series of observations was selected to depict interesting Army aviation weather scenarios for the Alabama area. The sequence of events proceeds from clear skies to rapidly deteriorating flight weather, such as thunderstorms, low clouds, and visibility restricting fog moving across the region. The CFAS/CFAR computer analyses show the rapid changes that occur from one observation time to another, the detail of weather depiction that is possible, and the principle of displaying weather according to weather categories indicative of weather threat to flight operations. A packet containing highlights of these results was put together for the purpose of demonstrating some of the advantages and value of automated weather analyses to Army operations.

2 WEATHER DATA BASES

2.1 DATA AND ANALYSIS WINDOWS

A square window 900 km on a side in the Southeastern United States was selected as the source of data for the CFAS sensitivity analysis, as shown in Fig. 2.1. While the CFAS program will accept data from any point within this 900 km window, actual grid point analyses occur only within the inner 500 kilometer square whose southwestern corner is 31° north latitude, 89° west longitude. Figure 2.2 is a topographic map of the 500 km inner square where intersecting lines represent the grid points of points of analyses. The state of Alabama is enclosed within and encompasses nearly all of the 500 km inner square where CFAS performs the grid point analyses.

These data windows were chosen due to the variability of weather conditions, or significant weathers, the high density of weather service stations which report regularly and the fact that the Fort Rucker Army Aviation Training Center is located in the center of the square.

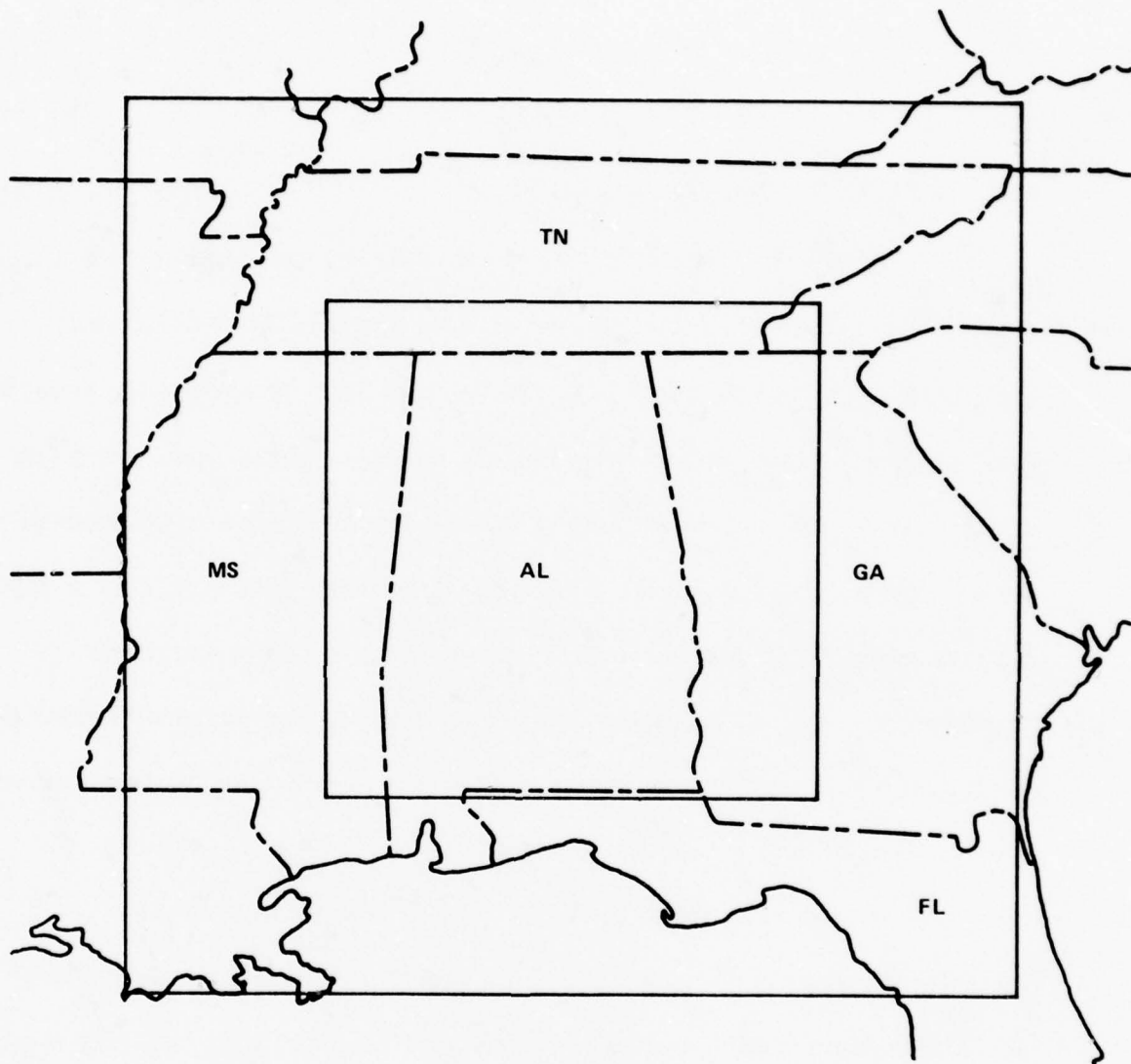


Fig. 2.1 Map Showing the Outer (900 km) and Inner (500 km) Data Acceptance and Analysis Square, Respectively

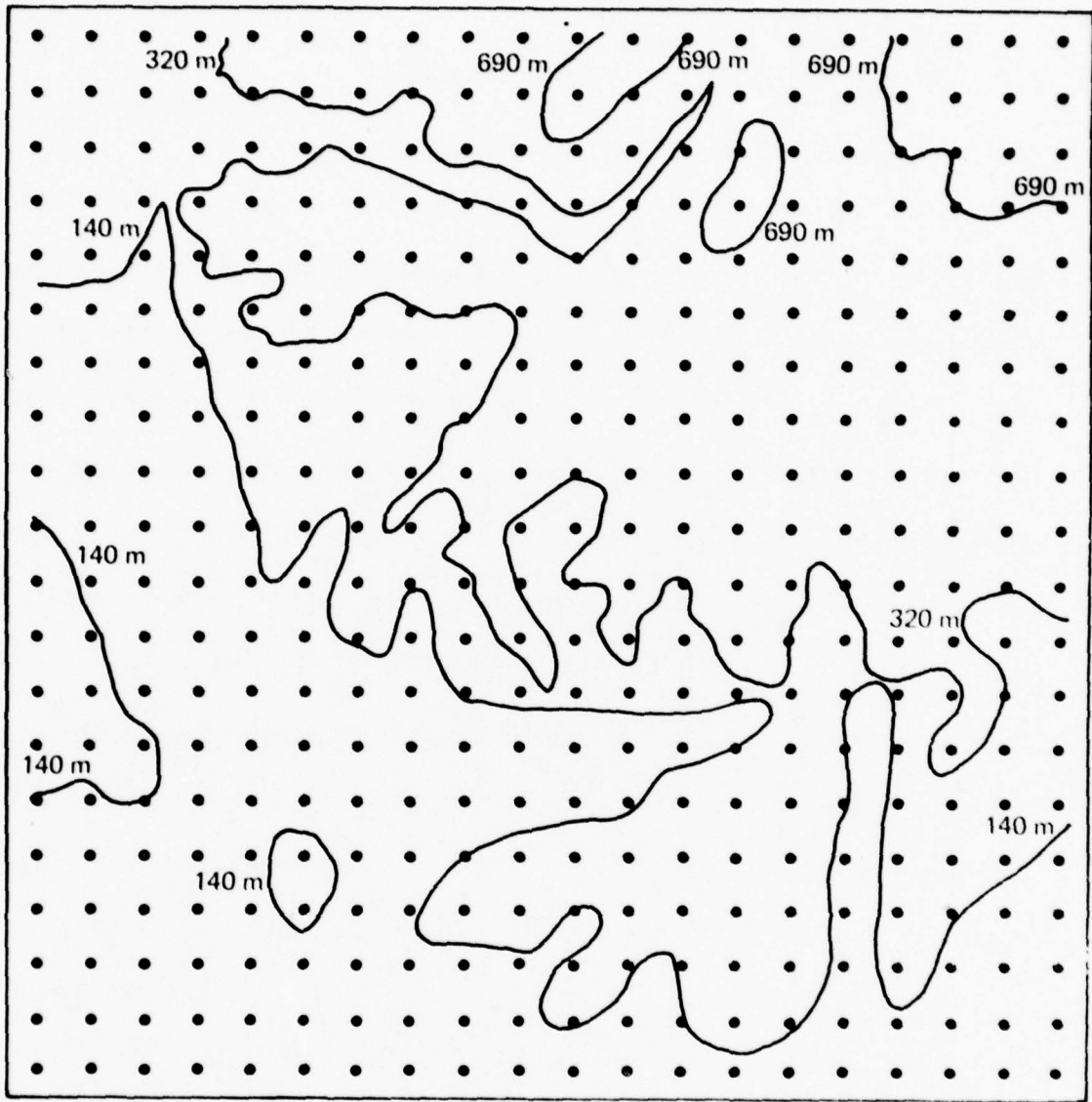


Fig. 2.2 Topographic Map of Inner (500 km) Analysis Square

2.2 SERVICE A - HOURLY WEATHER REPORTS

2.2.1 Station Location and Characteristics

There are 45 weather service stations within the 900 kilometer window which transmit hourly (SA) or supplementary (SW) aviation weather observations over teletype service A. Forty-two stations report regularly while 3 stations report very infrequently. These 45 stations report from nine states: Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee. The station locations range from 29° to 36° North Latitude and 81° to 90° West Longitude. The altitudes of the stations range from 0 to 805 meters above sea level. Table 2.1 gives a detailed account of each Service A station, its identifier, location, latitude, longitude and altitude in meters. Figure 2.3 shows all Service A stations and their locations within the 900 kilometer window, plotted on a mercator map projection, 1:7, 500,000 scale at latitude $22^{\circ} 30'$. Notice that the Service A stations are uniformly distributed throughout the entire window region.

TABLE 2.1 Service A Station Information

CALL LETTERS	NAME	LATITUDE NORTH	LONGITUDE WEST	ALTITUDE (METERS)
ABY	ALBANY GA	31° 32'	084° 11'	60
AGS	AUGUSTA GA	33° 22'	081° 58'	45
AHN	ATHENS GA	33° 57'	083° 19'	247
AMG	ALMA GA	31° 32'	082° 31'	63
ANB	ANNISTON AL	33° 35'	085° 51'	188
AND	ANDERSON SC	34° 30'	082° 43'	236
AQQ	APALACHICOLA FL	29° 44'	084° 59'	11
ATL	ATLANTA GA	33° 39'	084° 26'	315
AVL	ASHEVILLE NC	35° 26'	082° 32'	661
BHM	BIRMINGHAM AL	33° 34'	086° 45'	192
BNA	NASHVILLE TN	36° 07'	086° 41'	184
BTR	BATON ROUGE LA	30° 32'	091° 09'	23
BVE	BOOTHVILLE LA	29° 20'	089° 24'	0
CEW	CRESTVIEW FL	30° 47'	086° 31'	56
CHA	CHATTANOOGA TN	35° 02'	085° 12'	210
CSG	COLUMBUS GA	32° 31'	084° 56'	120
CSV	CROSSVILLE TN	35° 57'	085° 05'	570
DHN	DOTHAN AL	31° 19'	085° 27'	113
DYR	DEYERSBURG TN	36° 01'	089° 24'	105
FTY	ATLANTA GA	33° 47'	084° 31'	257
GLH	GREENVILLE MS	33° 29'	090° 59'	40
GNV	GAINSVILLE FL	29° 42'	082° 16'	50
GSP	GREENVILLE/SPRTNBG SC	34° 54'	082° 13'	296
GWO	GREENWOOD MS	33° 30'	090° 12'	41
HSV	HUNTSVILLE AL	34° 39'	086° 46'	196
JAN	JACKSON MS	32° 19'	090° 05'	101
JBR	JONESBORO AR	35° 50'	090° 39'	805
MCB	McCOMB MS	31° 16'	090° 28'	143
MCN	MACON GA	32° 42'	083° 39'	110
MEI	MERIDIAN MS	32° 20'	088° 45'	94
MEM	MEMPHIS TN	35° 03'	089° 59'	87
MGM	MONTGOMERY AL	32° 18'	086° 24'	62

TABLE 2.1 (Continued)

CALL LETTERS	NAME	LATITUDE NORTH	LONGITUDE WEST	ALTITUDE (METERS)
MGR	MOULTRIE GA	31 ^o 05'	083 ^o 48'	88
MKL	JACKSON TN	35 ^o 36'	088 ^o 55'	129
MOB	MOBILE AL	30 ^o 41'	088 ^o 15'	67
MSL	MUSCLE SHOALS AL	34 ^o 45'	087 ^o 37'	171
MSY	NEW ORLEANS LA	29 ^o 59'	090 ^o 15'	9
* NEW	NEW ORLEANS LA	30 ^o 02'	090 ^o 02'	3
PNS	PENSACOLA FL	30 ^o 28'	087 ^o 12'	36
* RMG	ROME GA	34 ^o 21'	085 ^o 10'	196
* SPA	SPARTANBURG SC	34 ^o 55'	081 ^o 57'	251
TCL	TUSCALOOSA AL	33 ^o 14'	087 ^o 37'	57
TLH	TALLAHASSEE FL	30 ^o 23'	084 ^o 22'	21
TYS	KNOXVILLE TN	35 ^o 49'	083 ^o 59'	299
VLD	VALDOSTA GA	30 ^o 47'	083 ^o 17'	66

* Stations report never or only once in our data sample

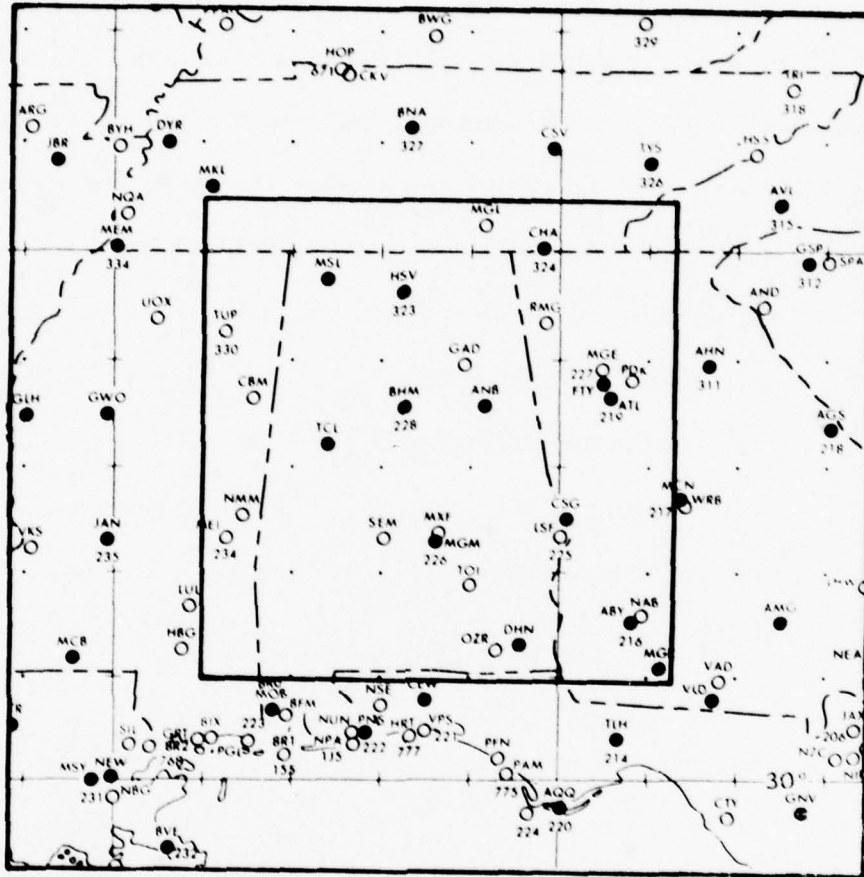


Fig. 2.3 Service A Station Locations

2.2.2 Aviation Weather Code and Data Used

Three types of Service A reports were used to build the data sets. They were the regularly scheduled hourly reports, SA, the irregular reports from supplementary stations, SW, and the special reports, SP, made when warranted by significant weather changes. The format of each of these reports provides for the following information:

1. Station Identifier
2. Type and Time of Report
3. Sky Condition and Ceiling
4. Visibility
5. Weather and Obstruction to Vision
6. Sea Level Pressure
7. Temperature and Dew Point
8. Wind Direction and Speed
9. Altimeter Setting
10. Runway Visual Range or Remarks

For the purposes of the sensitivity study we were concerned only with the station, type and time of report, sky condition and ceiling, visibility and present weather for those elements of the Service A report having some bearing on Army Aviation operations. Figure 2.4 is an example of the actual Service A teletype transmission, while Figure 2.5 is a sample of the coded message separated by information groups.

Figure 2.4 Service A Teletype Transmitted Report

SA 071001
RMG - /41/2-/3410/015/000/000VV9.+/
FTY 35 SCT E250 BKN 7 40/33/3310/009
ATL 250 SCT 12 150/41/33/3213000/006-ATL>1/13 3/1
MCK MS OVC 3F 175/50/49/3111/005
CSG E40 BKN 12 191/47/43/3207/010
ABY SP 07 BKN 12 OVC 7 50/50/3210/006/RB 20524-ABY>2/7
AMG-AMG>3/7
CAV 1 SCT 05 OVC 11/2R-L-F 140/53/43/3000/994/0030-CAV>11/14 3/3 3/7
SSI SP 4 SCT 07 BKN 15 OVC 2L-F 139/50/50/3400/994-SSI>11/18
VLF SP 04 OVC 7R- 56/56/3208/000/CIG RGD
MR
TLR SP 03 OVC 8R-F 179/57/56/3300/006/CIG RGD R- INTNF 0005/005
-TLR>1/9 2/15 3/6
JAX 015 BKN 7 139/71/67/2300/994 -JAX>1/2
GNV MS OVC 7 154/70/67/2410/999
MCO CLR 4H 164/67/65/2007/001-MCO>2/1
ORL CLR 4H /1906/001
MIA SP 05 BKN 5F 69/69/2300/000
TIX F100-TIX>1/1
VRD SP 00X 0F 169/72/71/2200/003
PIE S 01X1F 69/68/2000/003/R17LUV1
SRQ CLR 7 70/64/1305/004-SRQ>3/1
FMY 02X 7/0F 176/66/66/2000/005-FMY>0/11 2/10
ELL -X E2 BKN 2F 71/66/0000/006
MIA -X S SCT 2F 137/70/70/0000/000/F4-MIA>1/6
EYW CLR 12 179/75/69/1600/006-EYW>1/5

MISSING

MISSING

Figure 2.5 Coded Service A Transmission

Location Identifier and Type of Report	Sky and Ceiling	Visibility, Weather, & Obstruction to Vision	Sea Level Pressure	Temperature and Dew Point	Wind	Altimeter Setting	Remarks
CEW SP	-X E3	OVC 1/2 RF	123	/65/62	/2006	/990/	RB 30

The CFAS program searches for the most current and significant information, making the time, information content, and type of report important. A special report indicated by the letters SP after the station designator as in Figure 2.5, is weighed more heavily by CFAS than a regular hourly Service A report because it is the most current report and because Specials occur only when a significant change in weather has occurred. In the Service A transmission the sky condition and ceiling information follows the location and type of report. The sky condition is reported by one of seven sky cover designators given in Table 2.2.

TABLE 2.2 Summary of Sky Cover Designators

Designator	Meaning	Spoken
CLR	Clear (Less than 0.1 sky cover)	CLEAR
SCT	Scattered Layer Aloft (0.1 through 0.5 sky cover)	SCATTERED
BKN*	Broken Layer Aloft (0.6 through 0.9 sky cover)	BROKEN
OVC*	Overcast Layer Aloft (More than 0.9, or 1.0 sky cover)	OVERCAST
-SCT	Thin Scattered	THIN SCATTERED
-BKN	Thin Broken	THIN BROKEN
-OVC	Thin Overcast	THIN OVERCAST
	} At least 1/2 of the sky cover aloft is transparent at and below the level of the layer aloft	
X*	Surface Based Obstruction (All of sky is hidden by surfaced based phenomena)	SKY OBSCURED
-Y	Surface Based Partial Obscuration (0.1 or more, but not all, of sky is hidden by surface based phenomena)	SKY PARTIALLY OBSCURED

* Sky condition represented by this designator may constitute a ceiling layer

The height of the base of a layer of clouds precedes the sky cover designator. Height is reported in hundreds of feet above ground level. If the station designator is CLR, no height will be given since no sky cover is reported. When more than one layer is reported, layers are in ascending order of height. The height may be preceded by the letter "M" - measured ceilings, "E" - estimated ceiling, or "W" indefinite ceiling, meaning that regardless of the method of determination,

vertical visibility is classified as an indefinite ceiling. The ceiling designators are significant to CFAS as it searches for and weighs more heavily the information presumed to be most reliable. The measured height would therefore be more significant than either the estimate of the indefinite ceiling.

The visibility at the observation site immediately follows the sky condition and ceiling report. Visibility is the greatest distance objects can be seen and identified through at least 180° of the horizon. It is reported in statute miles and fractions. Visibility is important to CFAS as are cloud layers or any other factor affecting the pilots ability to see.

Weather and obstructions to vision when occurring at the station are reported immediately following visibility. The term weather refers to those items listed in Table 2.3 rather than to the more general meaning of all atmospheric phenomena. Weather is significant with regard to visibility as well as flying conditions, and therefore is important in the CFAS sensitivity analysis.

TABLE 2.3 Weather and Obstruction to Vision Symbols

A	Hail
BD	Blowing Dust
BN	Blowing Sand
BS	Blowing Snow
D	Dust
F	Fog
GF	Ground Fog
H	Haze
IC	Ice Crystals
IF	Ice Fog
IP	Ice Pellets
IPW	Ice Pellet Showers
K	Smoke
L	Drizzle
R	Rain
RW	Rain Showers
S	Snow
SG	Snow Grains
SP	Snow Pellets
SW	Snow Showers
T	Thunderstorm
T+	Severe Thunderstorm
ZL	Freezing Drizzle
ZR	Freezing Rain

Precipitation intensities are indicated thus:

--Very Light; -Light; (no sign) Moderate; + Heavy

2.3 SERVICE C - SYNOPTIC WEATHER

2.3.1 Station Location and Characteristics

There are 27 weather service stations within the 900 kilometer window which transmit Service C observations, 17 stations report regularly while 10 stations report very infrequently. All those stations reporting Service C also report Service A and report from the same states as Service A, except Arkansas. Again the station locations range from 29° to 36° North Latitude and 81° to 90° West Longitude. The altitudes of the stations range from 0 to 661 meters above sea level. Table 2.4 gives a detailed account of each Service C station, its identifier, location, latitude, longitude and altitude in meters. Figure 2.6 shows all Service C stations and their locations within the 900 kilometer window. Notice that in addition to being fewer in number, Service C stations are not as uniformly distributed as the Service A stations.

TABLE 2.4 Service C Station Information

STATION #	CALL LETTERS	NAME	LATITUDE NORTH	LONGITUDE WEST	ALTITUDE (METERS)
* 72213	AYS	WAYCROSS GA	31° 15'	082° 24'	46
72214	TLH	TALLAHASSEE FL	30° 23'	084° 22'	21
* 72216	ABY	ALBANY GA	31° 32'	084° 11'	60
72217	MCN	MACON GA	32° 42'	083° 39'	110
72218	AGS	AUGUSTA GA	33° 22'	081° 58'	45
72219	ATL	ATLANTA GA	33° 39'	084° 26'	315
* 72220	AQQ	APALACHICOLA FL	29° 44'	084° 59'	11
* 72221	VPS	ELGIN AFB FL	30° 29'	086° 31'	29
* 72222	PNS	PENSACOLA FL	30° 28'	087° 12'	36
72223	MOB	MOBILE AL	30° 41'	088° 15'	67
* 72224					
72226	MGM	MONTGOMERY AL	32° 18'	086° 24'	62
* 72227					
72228	BHM	BIRMINGHAM AL	33° 34'	086° 45'	192
72231	MSY	NEW ORLEANS LA	29° 59'	090° 15'	9
* 72232	BVE	BOOTHVILLE LA	29° 20'	089° 24'	0
72234	MEI	MERIDIAN MS	32° 20'	088° 45'	94
72235	JAN	JACKSON MS	32° 19'	090° 05'	101
72311	AHN	ATHENS GA	33° 57'	083° 19'	247
72312	GSP	GREENVILLE/SPRTNBRG SC	34° 54'	082° 13'	296
* 72313	SPA	SPARTANBURG SC	34° 55'	081° 57'	251
72315	AVL	ASHEVILLE NC	35° 26'	082° 32'	661
* 72323	HSV	HUNTSVILLE AL	34° 39'	086° 46'	196
72324	CHA	CHATTANOOGA TN	35° 02'	085° 12'	210
72326	TYS	KNOXVILLE TN	35° 49'	083° 59'	299
72327	BNA	NASHVILLE TN	36° 07'	086° 41'	184
72334	MEM	MEMPHIS TN	35° 03'	089° 59'	87

* Those stations not reporting in our data sample

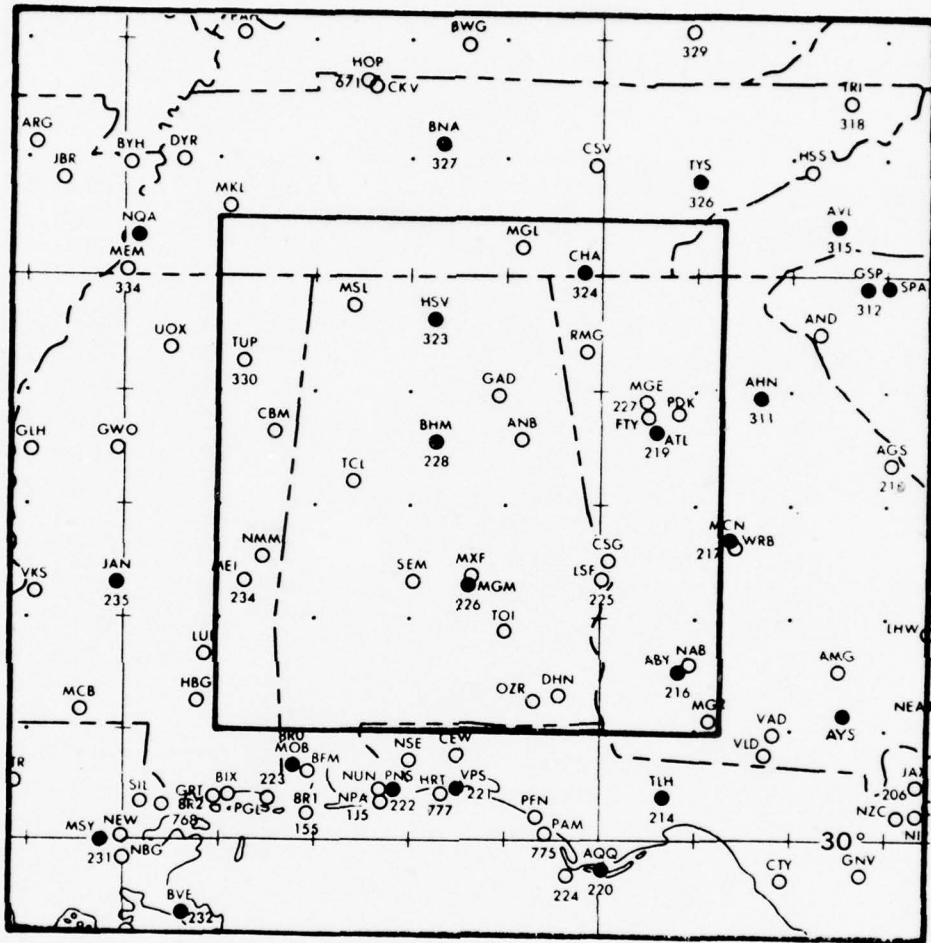


Fig. 2.6 Service C Station Locations

2.3.2 SYNOP Weather Code and Data Used

The complete form of surface synoptic report used in the CFAS sensitivity study is referred to as the primary synoptic, the 6-hourly report or SYNOP. The primary synoptic is reported at the standard hours of observation which are 0000, 0600, 1200, 1800 GMT. The reports are divided into the universal group and the supplementary group. The first seven or eight groups of the SYNOP code, Iiii through 6P₀P₀P₀P₀, are the universal or mandatory groups. That information selected from SYNOP for the sensitivity analysis is from the universal groups. The complete symbolic form of message used by United States stations in the 49 continental states for the primary synoptic report is represented in Fig. 2.7.

Figure 2.7 Symbolic Primary Synoptic Report

```
Iiii Nddff VVwwW PPPTT  
NhCLhCMCH TdTdapp (99ppp)  
6P0P0P0P0 (7RRR+s) (8NsChshs)  
(9SpSpspsp) (2R24R24R24R24)  
(3PWWPWWHWW) (dwdwPWWHWW)  
(4TxTxTnTn) (Additional Plain Language Data)
```

Figure 2.8 is an example of an actual Service C teletype transmitted report. Only a meteorologist who works daily with these codes can remember and rapidly interpret significant weather information contained within this string of numbers.

Figure 2.8 Service C Teletype Transmission

```

SMH01 *STL 051800
72A65 13313 80020 26204 00921 50112 53944 439170
72A58 13014 82030 25007 15672 55127 59722 444230
72A56 03127 74020 25407 00900 54008 59025 44526

72A46 02525 74020 24605 00921 57214 59865 441240

72A45
72A34 23114 69011 23004 21500 50100 53024 440350

72A39 82515 59022 21903 85577 52222 59039 438330
72A33
72A32
72A23 40011 66011 21009 21601 02127 53027 450340

72A60 02010 79011 25103 25700 58400 68505 437230
72A51 23110 74030 26107 11701 57105 69523 444170
72A50 +3412 02032 26408 00908 53127 59770 447210
72A00 75203 74021 24125 00906 +4502 59775 442260
72307 80705 66031 23407 00907 58105 59802 445230
72349 53611 63021 24604 00921 57305 59718 439250
72363 82217 80022 25502 00977 50303 68970 435240
72353 83114 80022 25107 00907 59803 59782 445280

72356
72340 60405 82021 24908 00928 54800 53076 447300
72340 50127 74031 22410 20978 00810 53025 450350

72334 00104 56021 23512 00907 01805 53129 45536

```

Table 2.5 defines those symbols of the SYNOP code used in the CFAS computer sensitivity analysis.

TABLE 2.5 Definition of SYNOP Code Symbols

IIiii	Numeric code for reporting station
N	Fraction of celestial dome covered by clouds
N _h	Fraction of celestial dome covered by all the low cloud (s) present. If no low cloud(s) is present, that fraction covered by all the middle cloud(s) present
C _L	Type of low cloud if low cloud is present (Sc, St, Cu, Cb)
h	Height, above ground, of the base of lowest cloud seen
C _m	Type of middle cloud if middle cloud is present (Ac, As, Ns)
C _H	Type of high cloud if high cloud is present (Ci, Cc, Cs)
W	Horizontal visibility at surface
W	Past weather
ww	Present weather

Service C reports are similar to Service A reports in that they are surface based observations and report much of the same information, such as, visibility, present weather, sea level pressure, temperature and dew point temperature. For the purposes of the sensitivity analysis the important Service C information which supplements the Service A reports is the detailed cloud information.

2.4 RADIOSONDE - UPPER AIR DATA

2.4.1 Station Location and Characteristics

There are 8 weather service stations within the 900 kilometer window which transmit radiosonde observations (RAOB), 7 stations reported regularly while one never reported in our data sample. These 7 stations report from five states: Florida, Georgia, Louisiana, Mississippi and Tennessee. The station locations range from 29° to 36° North Latitude and 82° to 90° West Longitude. The altitudes of the stations range from 0 to 326 meters above sea level. Table 2.6 gives a detailed account of each station which transmits radiosonde reports, the station identifier, location, latitude, longitude and altitude in meters. Figure 2.9 shows the stations and their locations within the 900 kilometer window. Notice that there are no radiosonde stations within the entire state of Alabama, which corresponds rather closely with the inner 500 km window where all detailed computer analyses are made.

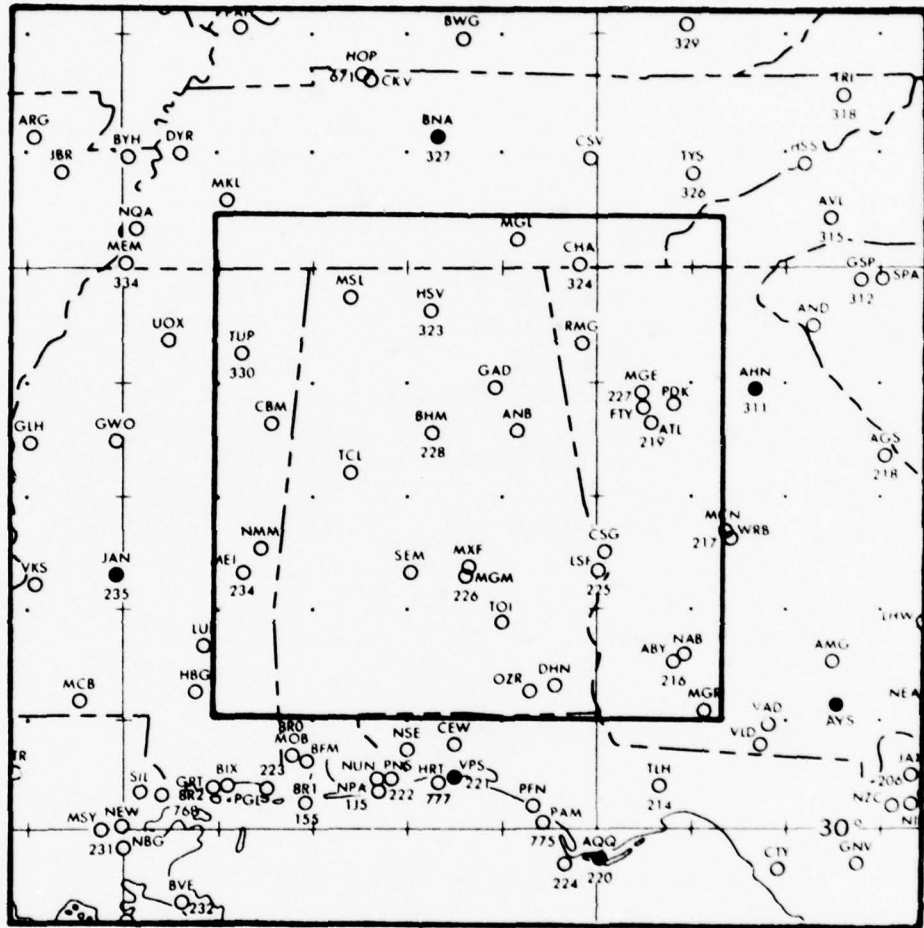


Fig. 2.9 RAOB Station Locations

TABLE 2.6 Radiosonde Station Information

STATION #	CALL LETTERS	NAME	LATITUDE NORTH	LONGITUDE WEST	ALTITUDE (METERS)
72213	AYS	WAYCROSS GA	31° 15'	082° 24'	46
72220	AQQ	APALACHICOLA FL	29° 44'	084° 59'	11
72221	VPS	ELGIN AFB FL	30° 29'	086° 31'	29
* 72227		MARIETTA/ DOBBINS AFB GA	33° 55'	084° 31'	326
72232	BVE	BOOTHVILLE LA	29° 20'	089° 24'	0
72235	JAN	JACKSON MS	32° 19'	090° 05'	101
72311	AHN	ATHENS GA	33° 57'	083° 19'	247
72327	BNA	NASHVILLE TN	36° 07'	086° 41'	184

* Never reports in our data sample

2.4.2 RAOB Weather Code and Data Used

Upper air soundings or radiosonde observations (RAOB) are reported in the radiosonde message. The standard times of RAOB messages are 0000, 0600, 1200, and 1800 GMT. The reports are divided into four parts, PARTS A, B, C, and D, each one able to be handled as a separate message. Parts A and B report only data for levels up to and including the 100 mb level. Data for levels above the 100 mb level are

reported in Parts C and D. Parts A and B report the levels of observation of Army aviation interest, consequently, for the purposes of the CFAS sensitivity study we were concerned only with Parts A and B. The complete symbolic form of radiosonde message used by United States stations for Parts A and B is represented in Figure 2.10.

Figure 2.10 Symbolic Form of Radiosonde Message

PART A	TTAA	YYGGI _d	Iiii	
	99P _o P _o P _o	T _o T _o T _{ao} D _o D _o	d _o d _o f _o f _o f _o	
	00hhh	TTT _a DD	ddfff	
	85hhh	TTT _a DD	ddfff	
	70hhh	TTT _a DD	ddfff	
	50hhh	TTT _a DD	ddfff	
	40hhh	TTT _a DD	ddfff	
	30hhh	TTT _a DD	ddfff	
	25hhh	TTT _a DD	ddfff	
	20hhh	TTT _a DD	ddfff	
	15hhh	TTT _a DD	ddfff	
	10hhh	TTT _a DD	ddfff	
		88P _t P _t P _t	T _t T _t T _{at} D _t D _t	d _t d _t f _t f _t f _t
		77 or } P _m P _m P _m 66	d _m d _m f _m f _m f _m	4v _b v _b v _a v _a
	PART B	TTBB	YYGG/	Iiii
00P _o P _o P _o		T _o T _o T _{ao} D _o D _o		
11PPP		TTT _a DD		
22PPP		TTT _a DD		
33PPP		TTT _a DD		
44PPP		TTT _a DD		
etc.			
	51515	101A _{df} A _{df}		

Standard isobaric surfaces are referred to as mandatory levels which are reported in PART A of the radiosonde message. Data for these mandatory levels used by CFAS are the standard isobaric surface indicator, geopotential height, temperature and dew point depression.

Significant levels are defined as levels at which temperature and/or relative humidity data are sufficiently important or unusual to warrant the attention of the forecaster, and/or are required for precise plotting of the radiosonde observation. These significant levels are reported in PART B of the radiosonde message. A sufficient number of significant levels must be reported so that a linear interpolation between any two consecutively transmitted levels will give a close approximation to the observed data. Once again for the purposes of the sensitivity study the level indicator, temperature and dew point depression are the important pieces of information. With this information a determination as to whether or not a cloud layer exists at each mandatory or significant level can be made. CFAS will consider this RAOB information along with the Service A and C information and weigh that information presumed to be most reliable and combine that information unique to each, creating the most accurate fully detailed synoptic picture possible, before making the final grid point analyses. Figure 2.11 is an example of a RAOB teletype transmission. Table 2.7 defines those symbols of the radiosonde

TABLE 2.7 Definition of Radiosonde Code Symbols

Iiii	Numeric code for reporting station
99	Indicator figures. Identifies the surface data groups (i.e., 99P ₀ P ₀ P ₀)
hhh	Geopotential in geopotential meters, or tens of geopotential meters, of the standard isobaric surface specified by the surface indicator. *
T ₀ T ₀	Observed temperature of the air in whole degrees Celsius at the surface
T _{ao}	Approximate tenths value and plus or minus sign indicator of the air temperature at the surface
00, 85, 70, 50, 40, 30, 25, 20, 15 and 10	Standard isobaric surface indicators. Identify the data groups for the 1000, 850, 700, 500, 400, 300, 250, 200, 150, and 100 mb levels in PART A
TT	Observed temperature of the air in whole degrees Celsius at the specified pressure level
T _a	Approximate tenths value and plus or minus sign indicator of the air temperature at the specified isobaric surface or significant level
11, 22, 33, etc.	Significant level indicator numbers in PART B

*Geopotential heights are reported in whole geopotential meters up to but not including the 500 mb surface. Geopotential heights are reported in tens of geopotential meters (i.e., decameters) for the 500 mb surface and higher

code used in the CFAS sensitivity analysis.

Figure 2.11 RAOB Teletype Transmitted Report (PARTS A and B)

```
UUMX2 MXSA 051200 RTD
TTAA 55124 76458 99210 11411 34285 22288 16257 34283 85462
12273 27503 78265 84269 25027 59574 19152 25054 48742 28931
25297 32958 37338 25282 45777 20228 55377 15488 61177 18554
70377 88999 56382 25184 43477E

TTBB 55127 76458 78210 11411 11832 16257 22982 17451 33768
29272 44777 24269 55602 22071 56557 25377 77522 12152 83475
12717 99429 15543 11486 22700 22122 28931 33348 27552 44312
34556 55279 39963 65221 51577 77133 59577 88158 61177 99188
70377E
```

2.5 VARIABLE STATION DENSITY DISTRIBUTION

Several station density distributions were used in the performance of the sensitivity analysis. The maximum station density available in the "Alabama Square" consisted of all of the Service A Airways stations included within the square. The fractional density distributions were created by eliminating selected stations from the data set.

The several station densities selected are listed in Table 2.8 together with the number of stations in the distribution and the mean distance between stations. Figures 2.12 through 2.18 illustrate the various station distributions listed in Table 2.8. Tables 2.9 through 2.14 show for each of the station distributions a list of the stations used and for each station the closest neighboring station and the distance between them.

The stations selected for elimination to produce the fractional density distributions were chosen subjectively such that the resultant station distribution was as uniform as possible. Starting with Figure 2.12, the full station density, the analyst eliminated $1/4$, $1/2$, $3/4$, $7/8$ and $15/16$ of the full density stations to produce respectively the $3/4$, $1/2$, $1/4$, $1/8$, and $1/16$ density station distributions. In the case of the $3/4$ density station distribution we compared the results of the subjective

method with an objective technique. In the objective technique we eliminated 13 stations from the full station distributions which were closest to one another as per Table 2.9. The results obtained by the objective technique are shown in Figure 2.19 and Table 2.15. It will be noted that there is fairly good agreement between these results and those obtained by the subjective method.

TABLE 2.8 Station Densities Used in CFAS Sensitivity Analysis

<u>Density</u>	<u>No. of Stations</u>	<u>Mean Distance Between Stations</u>
Full	41	93 km
3/4	27	119 "
1/2	19	131 "
1/4	10	198 "
1/8	5	277 "
1/16	2	540 "
S.A.	20	N.A.

S.A. - Silent Area
 N.A. - Not Applicable

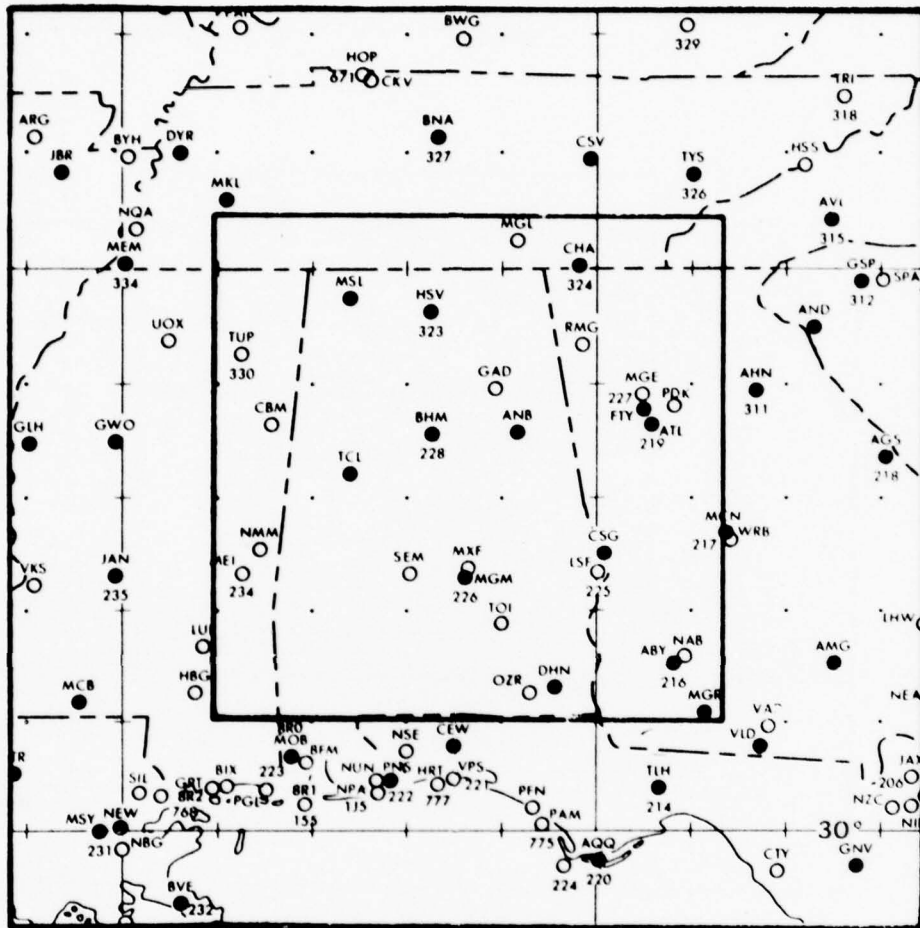


Fig. 2.12 Full Station Density

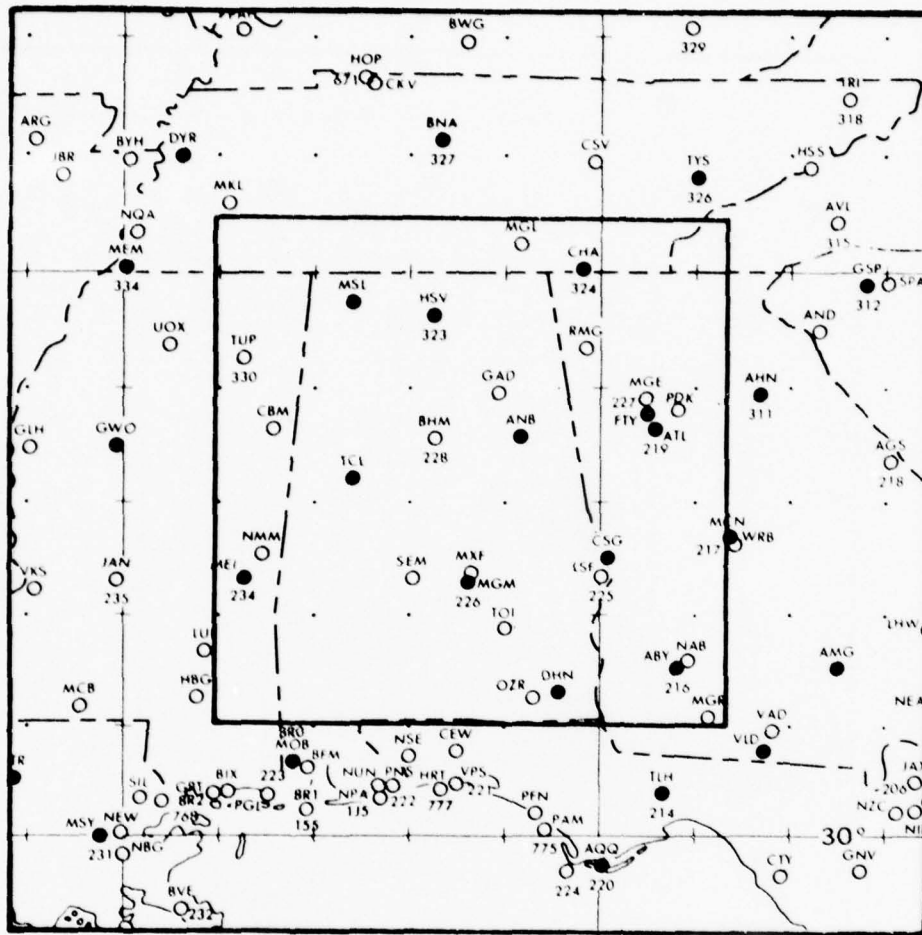


Figure 2.13 3/4 Station Density

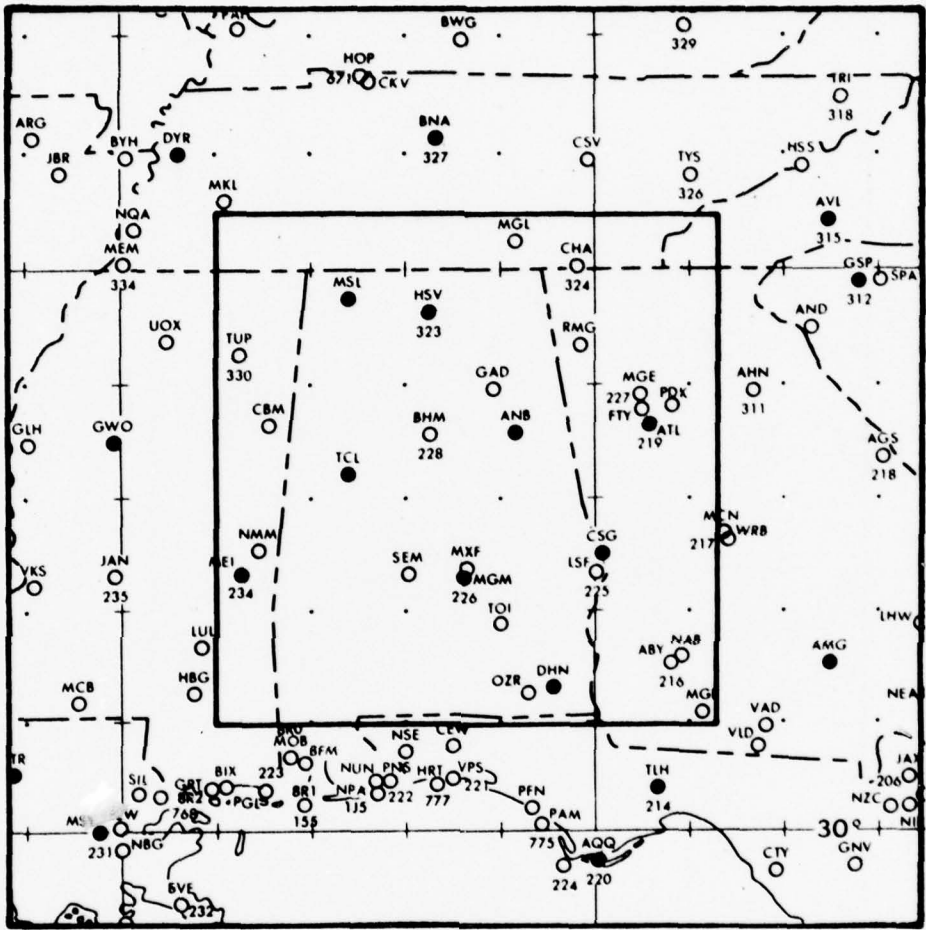


Figure 2.14 1/2 Station Density

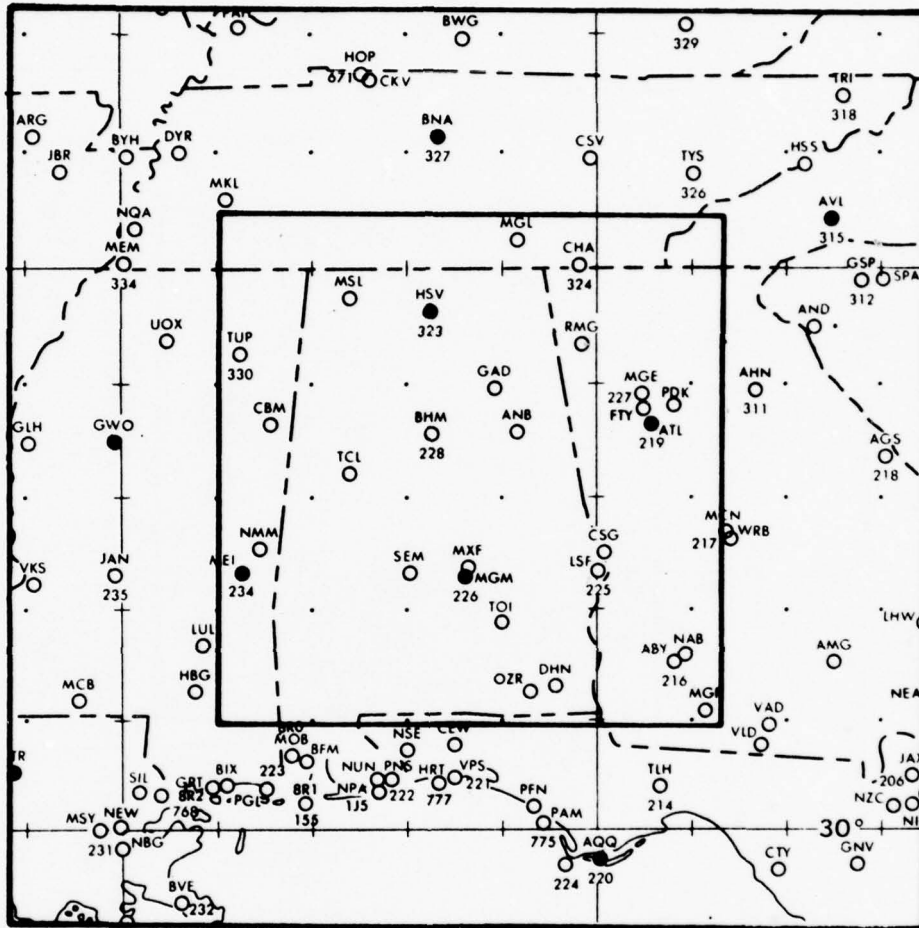


Figure 2.15 1/4 Station Density

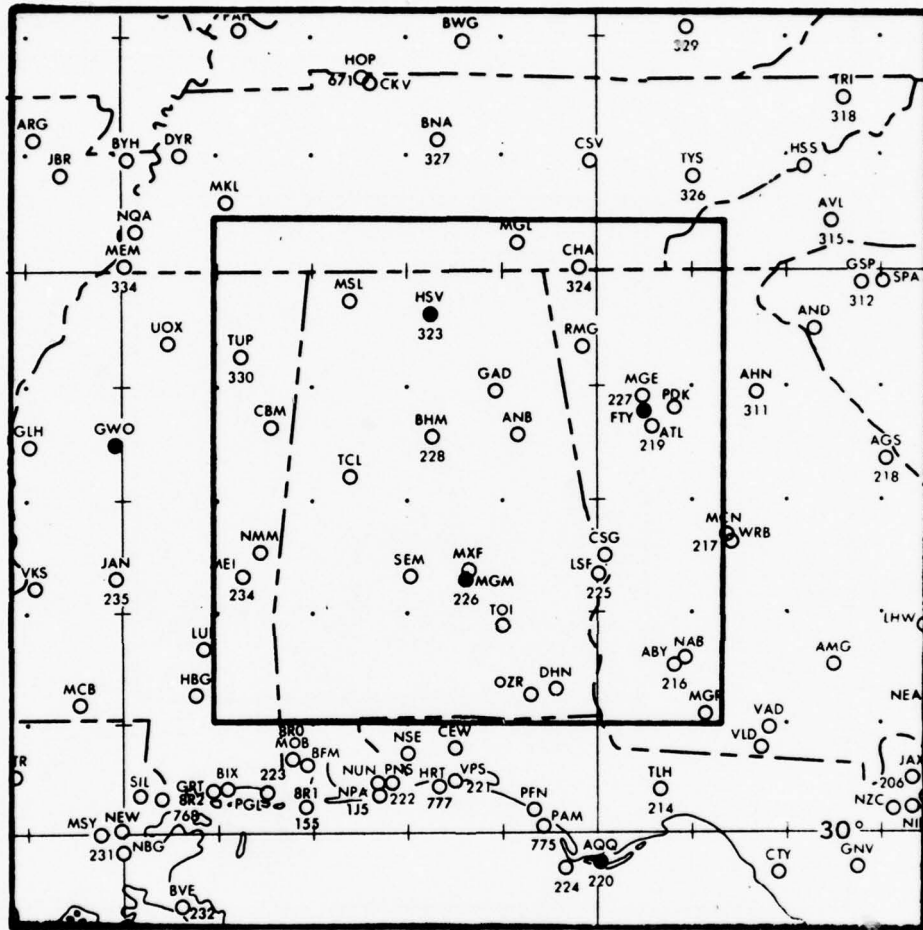


Figure 2.16 1/8 Station Density

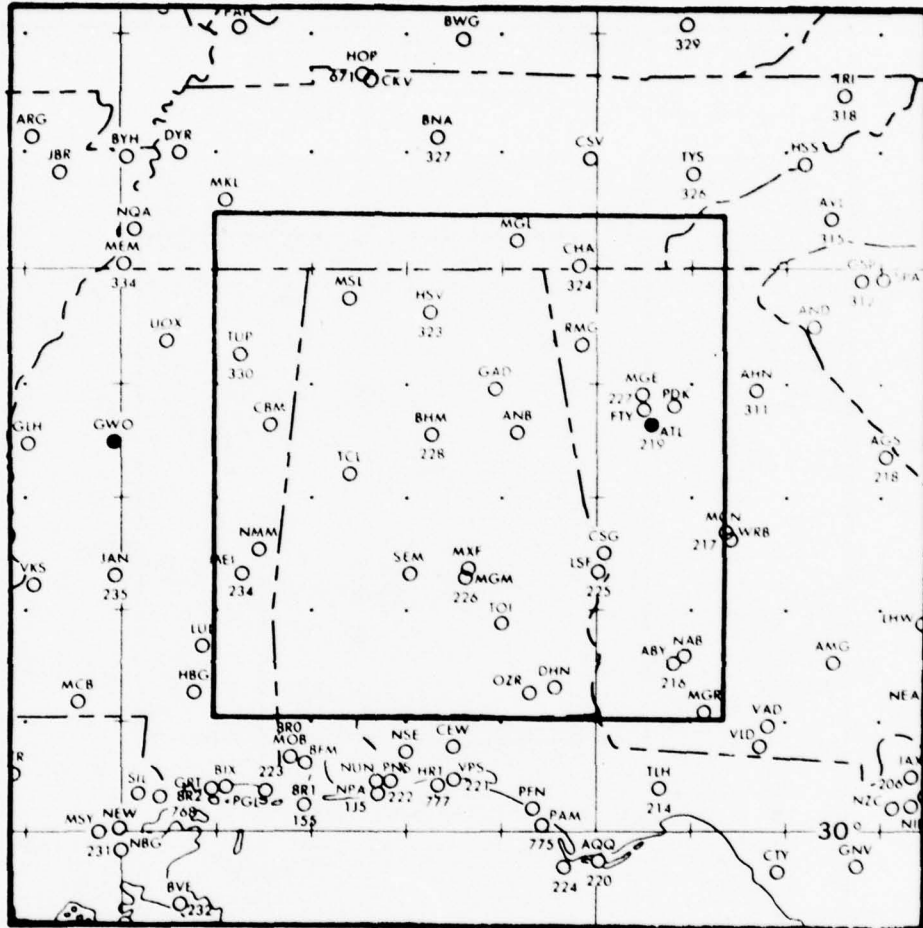


Figure 2.17 1/16 Station Density

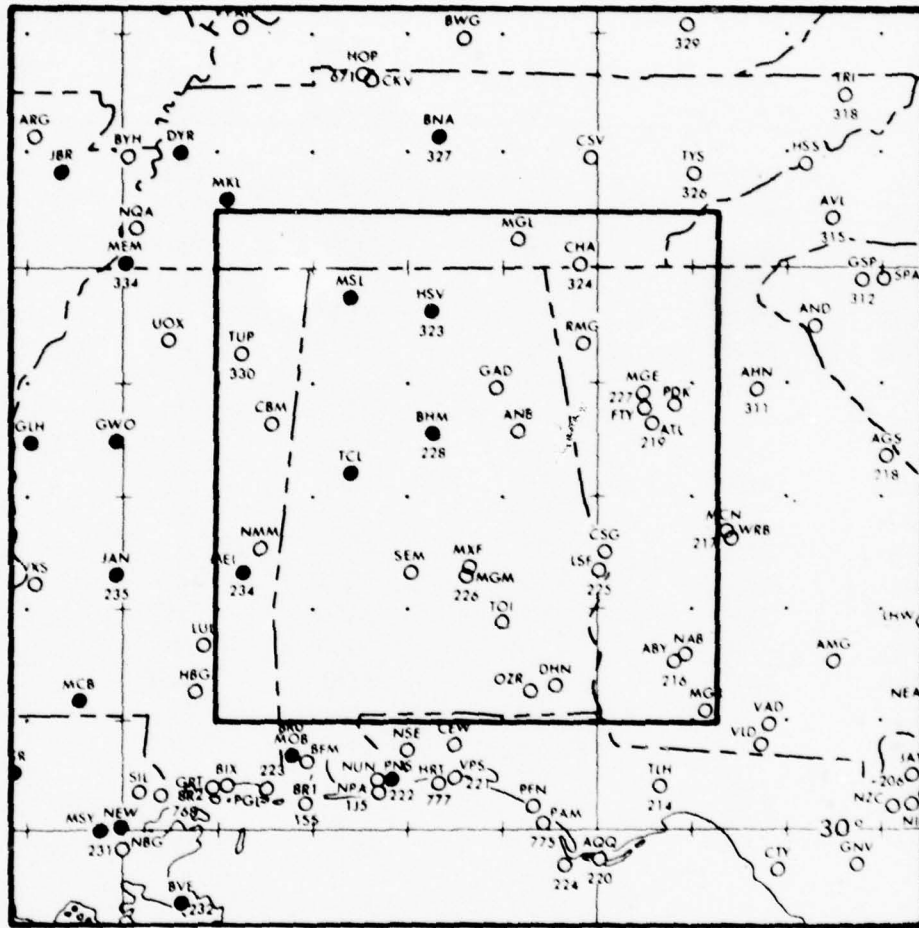


Figure 2.18 Silent Area Stations

TABLE 2.9 Full Station Density

Station	Nearest Neighbor	Distance Km	Station	Nearest Neighbor	Distance Km
ABY	MGR	55	GLH	GWO	83
AGS	AHN, AND	150	GNV	VLD	150
AHN	AND	90	GSP	AND	65
AMG	VLD	110	GWO	GLH	83
ANB	BHM	85	HSV	MSL	81
AND	GSP	70	JAN	MEI	125
AQQ	TLH	96	JBR	MEM	110
ATL	FTY	15	MCB	BTR	98
AVL	GSP	68	MCN	CSG	125
BHM	ANB	82	MEI	JAN	125
BNA	CSV	150	MEM	JBR	110
BTR	MCB	98	MGM	CSG, DHN	145
BVE	MSY	105	MGR	ABY	55
CEW	PNS	71	MKL	DYR	68
CHA	CSV	110	MOB	PNS	100
CSG	MCN	125	MSL	HSV	81
CSV	TYS	103	MSY	BTR	105
DHN	CEW	115	PNS	CEW	71
DYR	MKL	68	TCL	BHM	92
FTY	ATL	15	TLH	AQQ	96
			VLD	MGR	68

TABLE 2.10 3/4 Station Density

Station	Nearest Neighbor	Distance Km	Station	Nearest Neighbor	Distance Km
ABY	VLD	118	DHN	ABY	121
AHN	ATL	110	HSV	MSL	81
ANB	FTY	128	MEI	TCL	150
AMG	VLD	110	MEM	DYR	125
AQQ	TLH	96	MCN	CSG	125
ATL	FTY	15	MGM	CSG, DHN	140
BNA	HSV	170	MOB	MEI	188
BTR	MSY	105	MSY	BTR	105
CHA	TYS	145	TCL	MEI	148
CSG	MCN	125	TLH	AQQ	96
DYR	MEM	125	TYS	CHA	145
FTY	ATL	15	VLD	TLH	110
GSP	AHN	150	MSL	HSV	81
GWO	MEM	179			

TABLE 2.11 1/2 Station Density

Station	Nearest Neighbor	Distance Km	Station	Nearest Neighbor	Distance Km
ANB	ATL	135	GSP	AVL	70
AMG	TLH	212	GWO	MEI	181
AQQ	TLH	96	HSV	MSL	81
ATL	CSG, ANB	140	MEI	TCL	150
AVL	GSP	70	MGM	CSG, DHN	140
BNA	HSV	170	MSL	HSV	81
BTR	MSY	105	MSY	BTR	105
CSG	MGM, DHN, ATC	140	TCL	MEI	150
DHN	MGM, CSG	140	TLH	AQQ	96
DYR	MSL	222			

TABLE 2.12 1/4 Station Density

Station	Nearest Neighbor	Distance Km	Station	Nearest Neighbor	Distance Km
AQQ	DHN	180	DHN	MGM	140
ATL	MGM	240	GWO	MEI	181
AVL	ATL	271	HSV	BNA	170
BNA	HSV	170	MGM	DHN	140
BTR	MEI	305	MEI	GWO	181

TABLE 2.13 1/8 Station Density

Station	Nearest Neighbor	Distance Km	Station	Nearest Neighbor	Distance Km
AQQ	MGM	315	HSV	ATL	248
ATL	MGM	240	MGM	ATL	240
GWO	HSV	341			

TABLE 2.14 1/16 Station Density

Station	Nearest Neighbor	Distance Km	Station	Nearest Neighbor	Distance Km
ATL	GWO	540	GWO	ATL	540

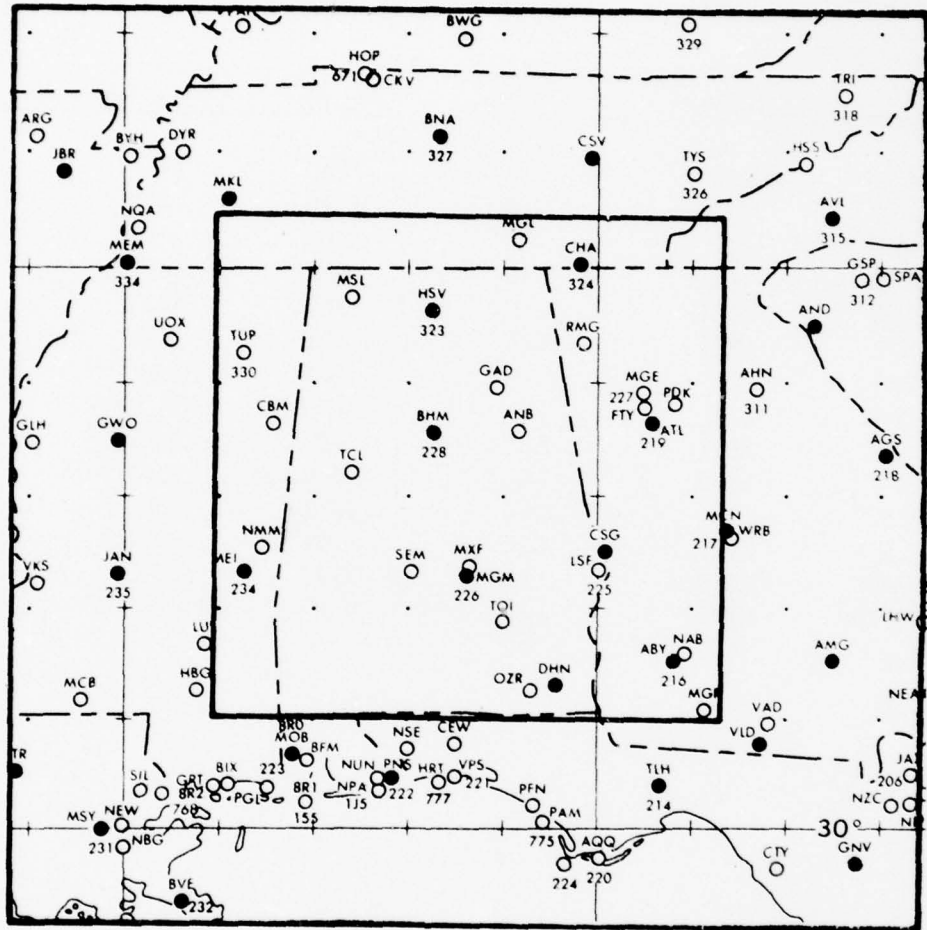


Figure 2.19 3/4 Station Density by Objective Technique

TABLE 2.15 3/4 Station Density by Objective Technique

Station	Nearest Neighbor	Distance Km	Station	Nearest Neighbor	Distance Km
ABY	DHN, VLD	120	GWO	JAN	130
AGS	AND	150	HSV	BHM	125
AMG	VLD	110	JAN	MEI	125
AND	AVL	105	JBR	MEM	110
ATL	MCN	130	MCN	CSG	125
AVL	AND	105	MEI	JAN	125
BHM	HSV	125	MEM	JBR	110
BNA	CSV	150	MGM	CSG, DHN	140
BTR	MSY	105	MKL	MEM	122
BVE	MSY	105	MOB	PNS	100
CHA	CSV	110	MSY	BTR	105
CSG	MSN	125	PNS	MOB	100
CVS	CHA	110	TLH	VLD	105
DHN	ABY	120	VLD	AMG, TLH	105
GNV	VLD	150			

Thus, Figures 2.12 to 2.17 show graphically the number and distribution of weather stations used to study the effect of data density on the objective analysis results. These cases are more representative of the type of data distributions expected, ranging from highly to sparsely populated regions. Figure 2.18, on the other hand, is more representative of a battlefield situation where observations exist in the friendly territory but none exist from the opponent's region, called a silent area. The influence of these data distributions on the CFAS analysis program is discussed in section 4.

2.6 SELECTED WEATHER SEQUENCES

This section contains plots of weather observed within the 900 km square centered about the state of Alabama. Eight time sequences of weather are plotted beginning 26 February 1977 at 1640Z and ending 27 February 1977 at 0810Z, as shown in Figures 2.20 to 2.27. This time series was used in analyzing and preparing material which demonstrates capabilities of automated weather depiction for pilots. Another weather plot is given for 7 March 1977 at 0026Z since it represents data used in the sensitivity study on the effects of changes in control parameters and type, distribution, and density of observations. Individual weather plots were made at each station location because the standard facsimile surface weather charts were not sufficiently legible, which is often the case when attempting to read printed detail from facsimile charts. The weather data were plotted from the teletype paper strips as follows:

1. scattered and broken clouds are indicated by a single and double vertical line through the station circle,
2. overcast skies are represented by a solid circle,
3. visibility is given in miles to the left of the station circle,
4. ceiling is given in hundreds of feet below the station circle, and
5. present weather symbols are located on the lower left side

of the station circle. Three horizontal lines indicate fog, the figure eight laying on its side implies haze, a comma and period represent drizzle and rain, respectively, a triangle depicts showers, and the capital letter R with an arrow represents a thunderstorm.

Progression of weather throughout the February time sequences varied considerably from good to bad flight conditions. The time series begins 26 February 1977 with 1600Z routine hourly weather observations and special observations up to 40 minutes past the hour plotted on the same chart. Whenever a special occurred, it was plotted in lieu of the hourly value to show the most current weather. One of the reasonings for presenting data in this manner is because the computer can rapidly update an analysis to account for significant weather changes. This feature of rapid updating and displaying most current weather is a distinct advantage made possible by the computer analysis system. Rather than have a pilot hover over the teletype output searching for specials of interest to him, the computer system can accomplish this task automatically, plus properly assimilate, incorporate, and tailor this information to his needs. Thus, many of the weather plots were purposely selected at times other than those corresponding to the standard on-the-hour report. Not only does this allow for and incorporate more non-routine special observations but it is actually more realistic in terms of

what pilots experience. That is to say, a pilot may prepare for his flight at any time during the day and it would be unusual to correspond precisely with the fixed time of a routine meteorological observation.

Notice that the 26 February 1640Z map begins the weather sequence with clear skies in the eastern and cloudy conditions in the western section of map. Visibilities are high at all locations with the only reported restriction to visibility being haze at one location. Ceilings range from 2000 feet to unlimited in Alabama. Four hours later the first rain showers and thunderstorms begin to appear at the westernmost stations, yet the visibilities remain high. Three hours later at 0000Z February 27, showers and thunderstorms begin to restrict visibility, lower ceilings, and cause fog resulting from precipitation. A pattern becomes more discernible at 0340Z February 27 showing a northeast-southwest axis of rain, showers, and thunderstorms. This pattern prevails throughout the remaining time sequence, moves slowly eastward, and intensifies.

Ahead of the squall line in the clear eastern section, radiation fog is forming and restricting visibilities under clear skies. The radiation fog is pronounced only in the southeastern portion of the map and reduces visibilities to as low as one quarter of a mile. Many changes in meso-scale weather features are contained within this time sequence. Details

and changes will become more apparent when viewing results in chapter 5 provided by computer analyses.

The map for 7 March 1977 0026Z, Figure 2.28, constitutes the verification data used to study sensitivity of analyses due to type, distribution, and density of weather data. In addition to special weather observations at 0026Z, the available computer data base included all standard and non-routine observations for the previous 12 hours. The horizontal distribution of weather shows clear skies in the northwest section of the map, cloudy conditions along a northeast-southwest line, and haze, fog, drizzle, and rain dominating the entire southeastern sector. Visibilities ranged from one mile in rain and fog to 15 miles under clear skies. Ceilings ranged from being non-existent during clear and partly cloudy skies to a low of 300 feet in fog and rain. Thus, weather events depicted on the verification map show considerable diversity in type and range of values.

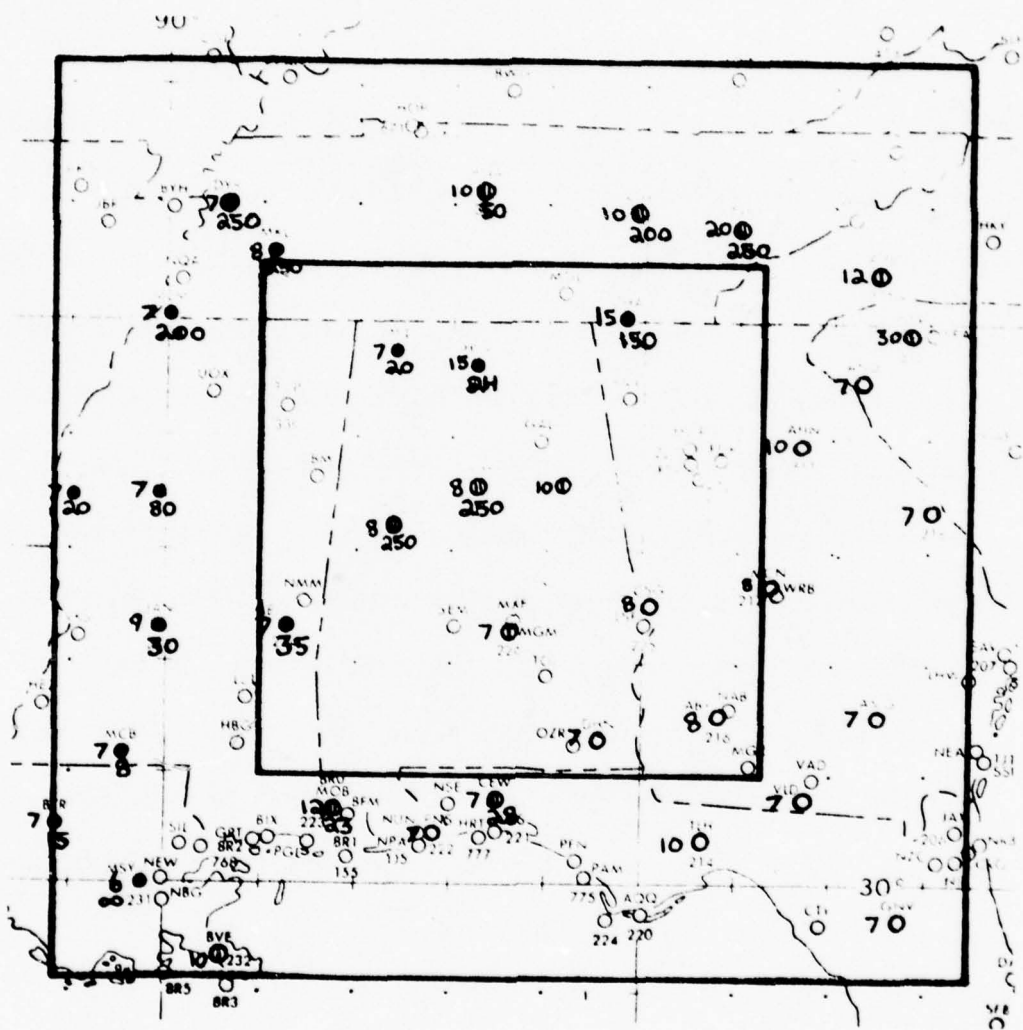


Fig. 2.20 Weather Map 1640Z Feb. 26, 1977

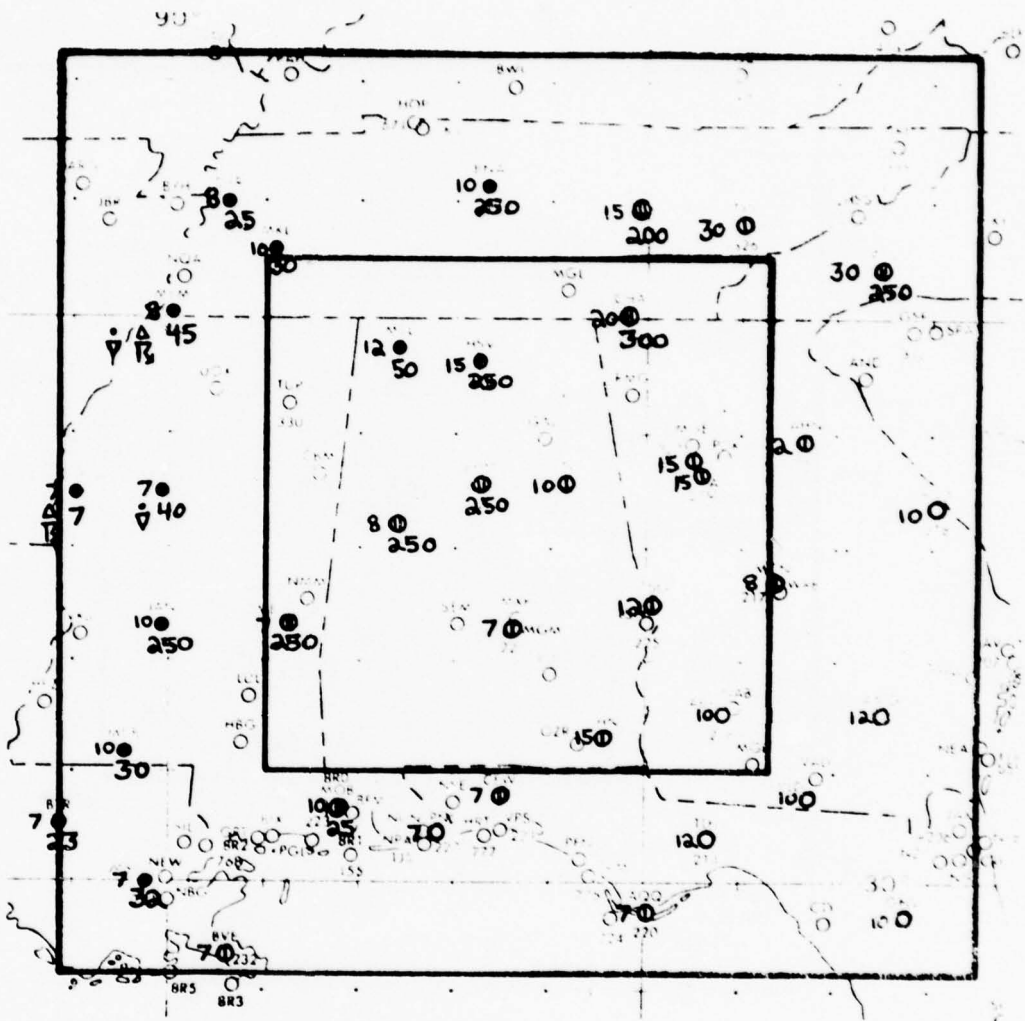


Fig. 2.21 Weather Map 2120Z Feb. 26, 1977

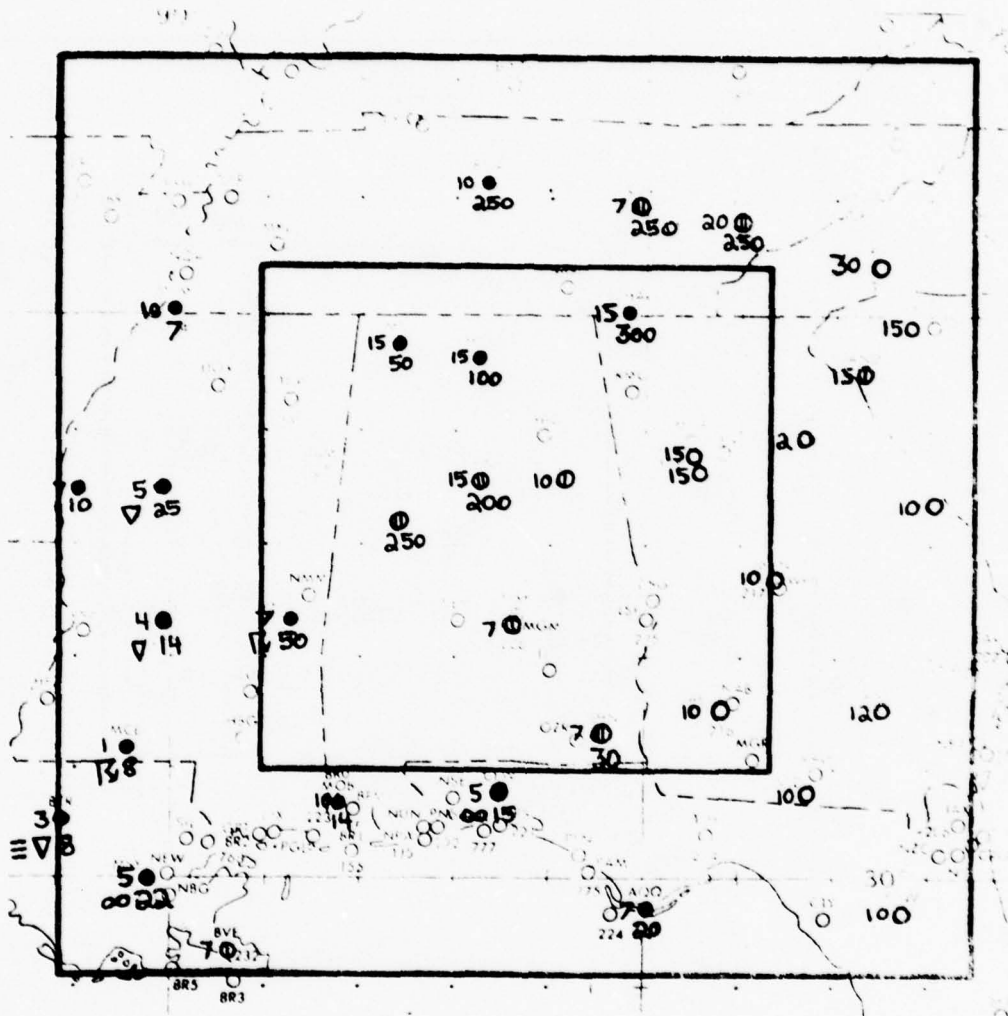


Fig. 2.22 Weather Map 0000Z Feb. 27, 1977

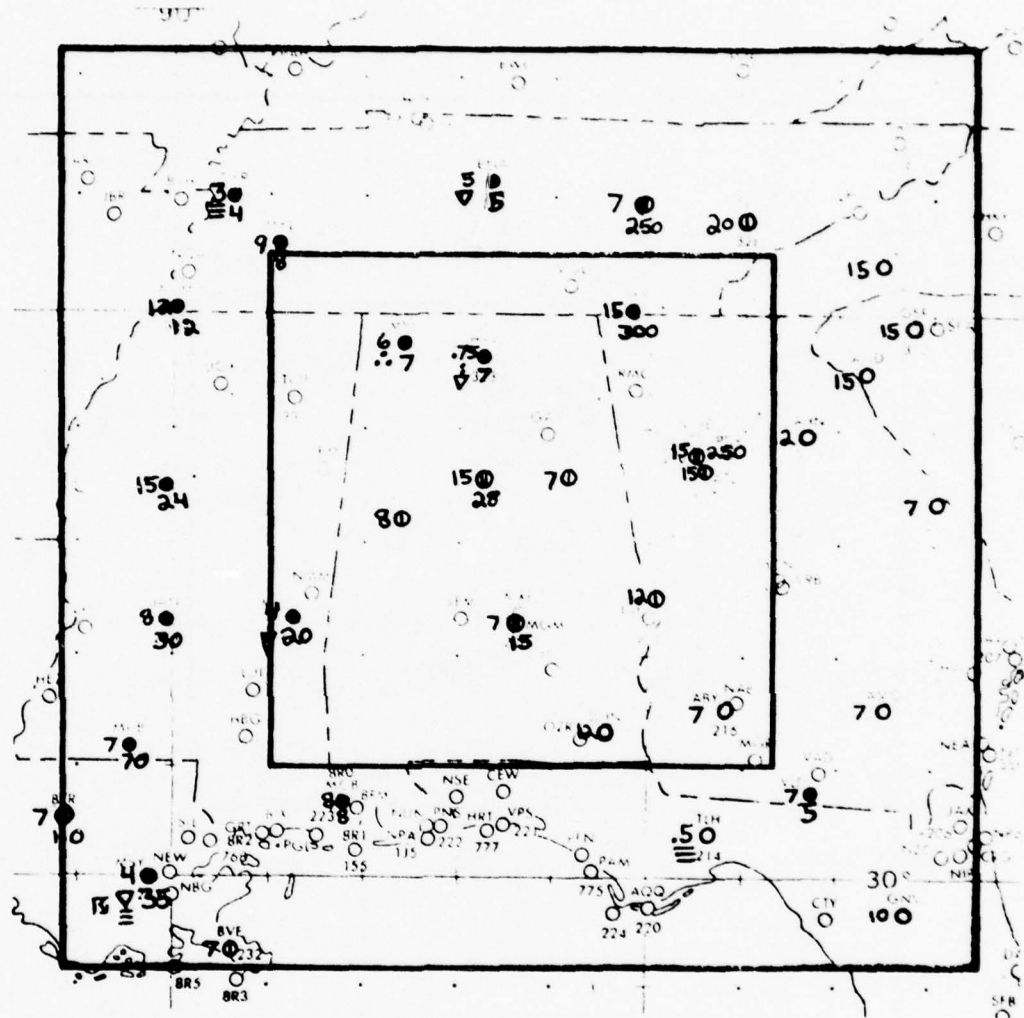


Fig. 2.23 Weather Map 0340Z Feb. 27, 1977

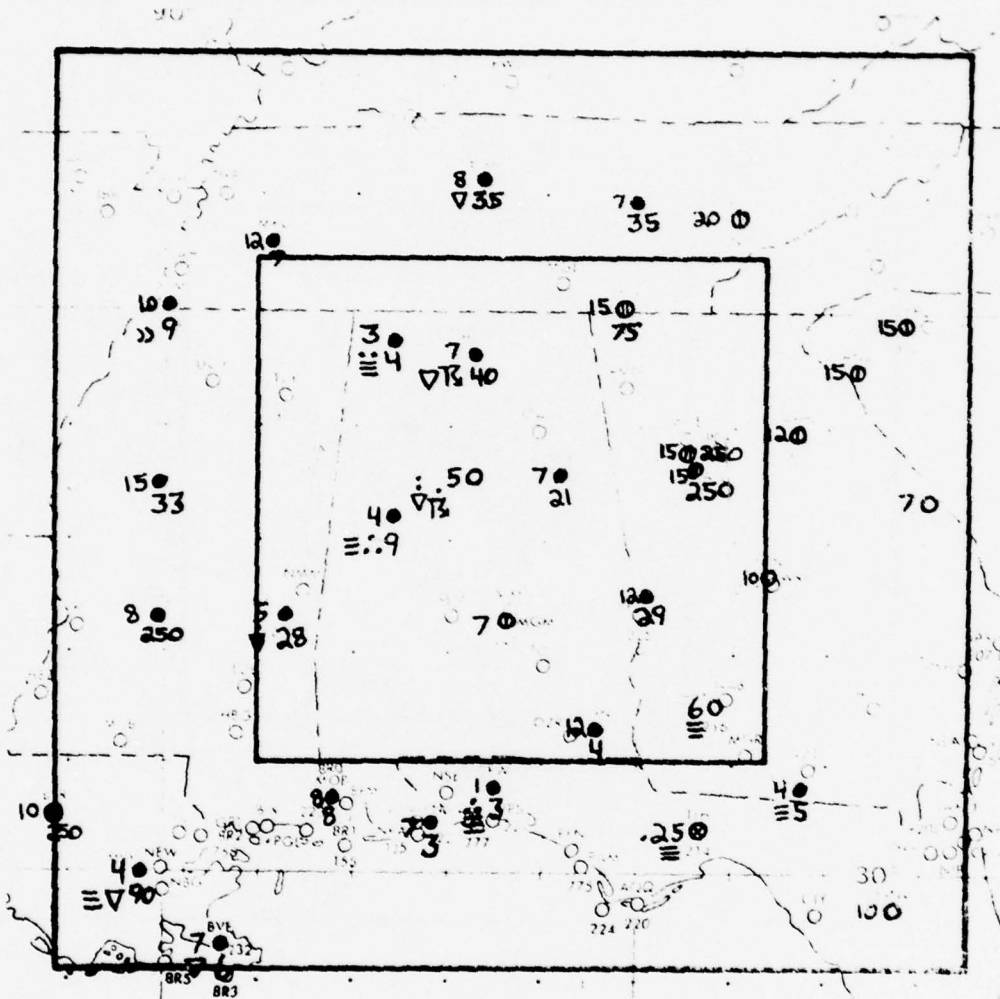


Fig. 2.24 Weather Map 0510Z Feb. 27, 1977

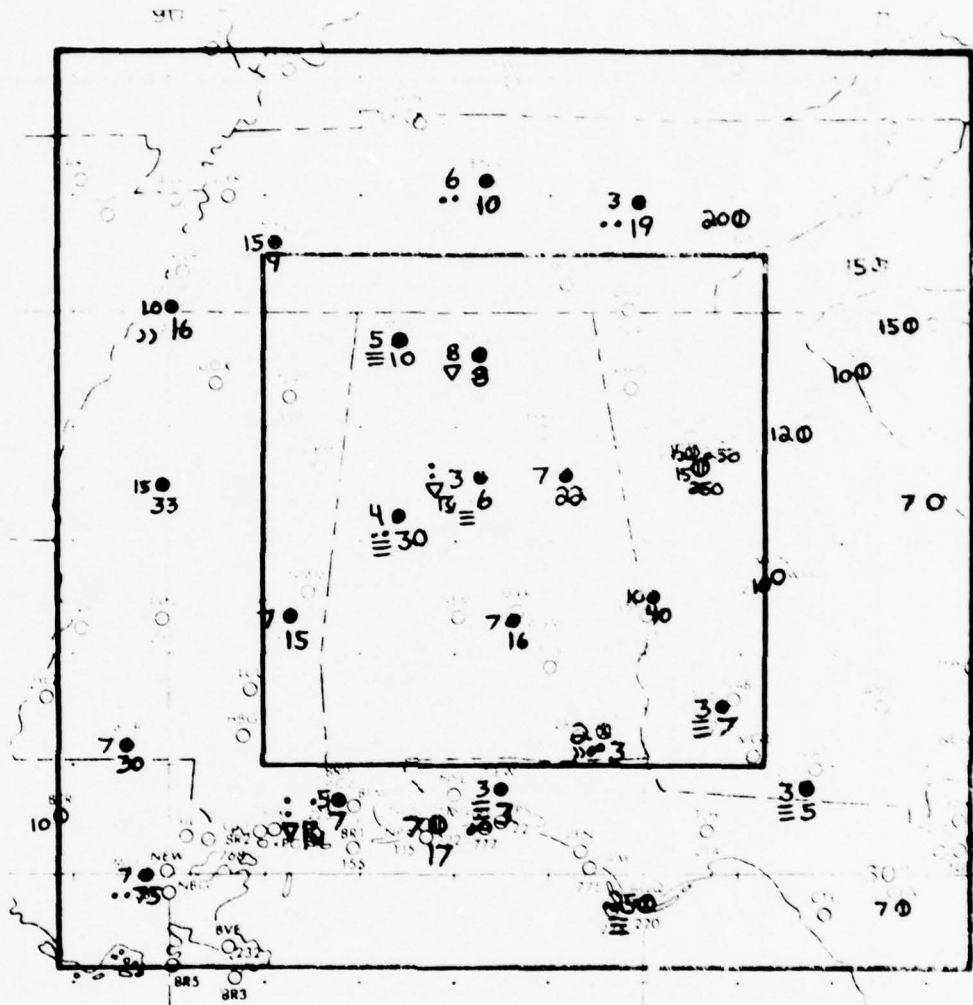


Fig. 2.25 Weather Map 0640Z Feb. 27, 1977

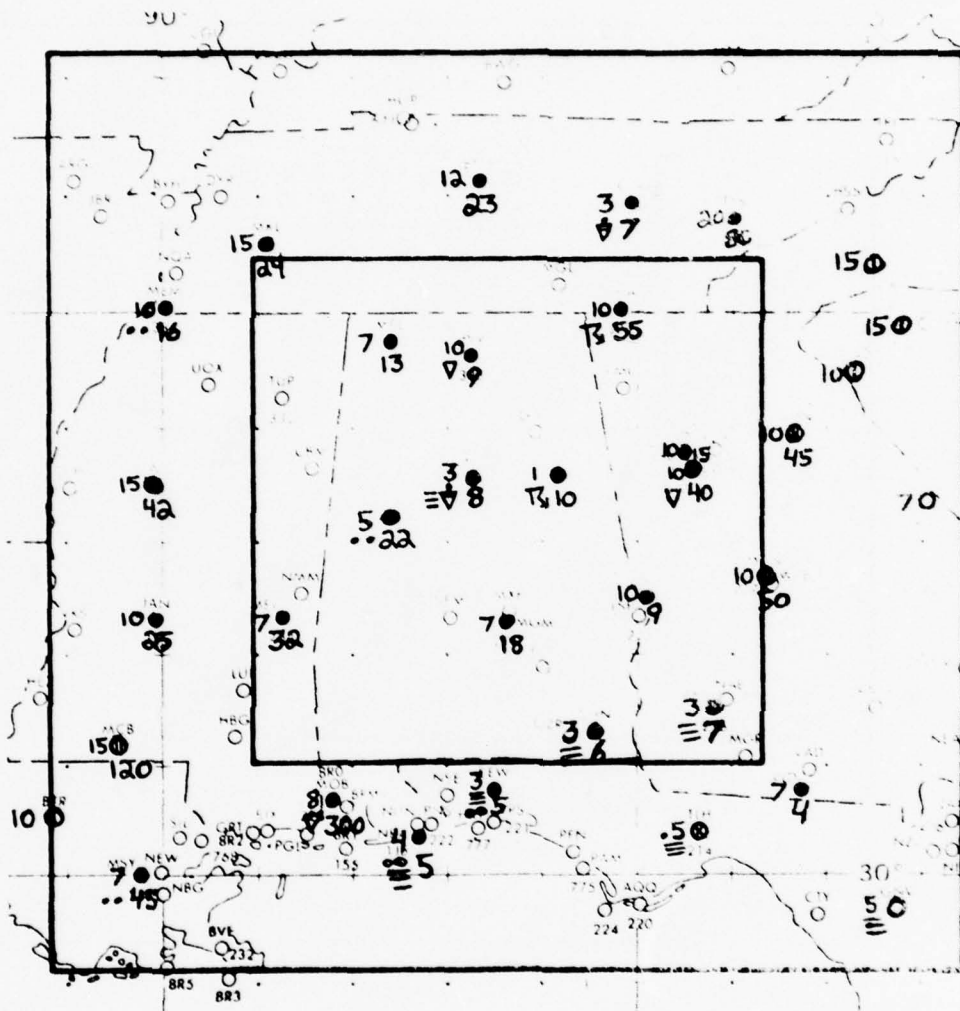


Fig. 2.26 Weather Map 0720Z Feb. 27, 1977

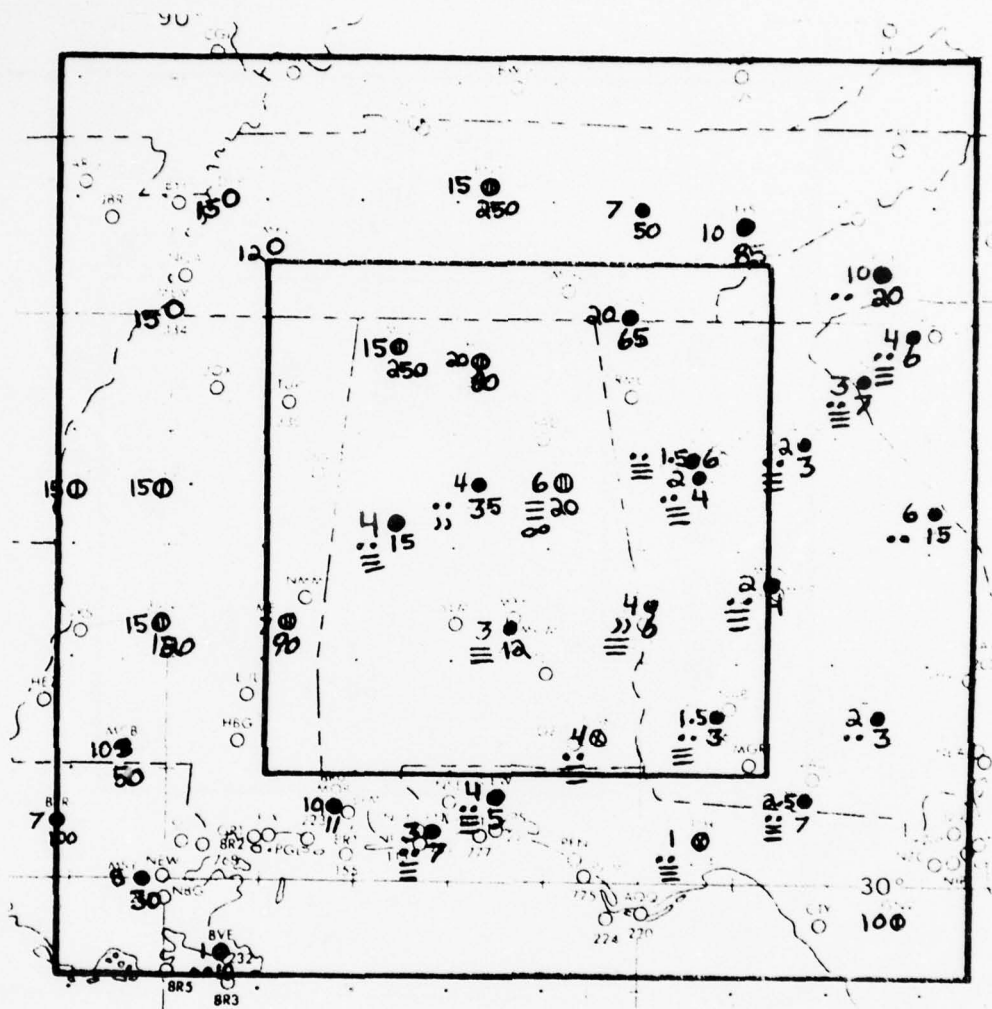


Fig. 2.28 Weather Map 0026Z Mar. 7, 1977

2.7 DATA ENTRY PROCEDURE

The Service A aviation hourlyies, Service C Synoptic and Upper Air data were obtained in the medium of teletype printed paper from the National Weather Service Field Office in Atlanta, GA. A problem that had to be solved was that of putting a rather large amount of data onto a computer card or magnetic tape in the format required by the CFAS.

Our approach was to enter the data into the buffer memory of our Decwriter II LA-36 terminal in a format convenient to the operator. This enabled the data to be entered in considerably less time than would have been required had we used the CFAS format. The Decwriter's memory was sufficient to allow several hours worth of Service A, C and Upper Air data to be entered. However, for convenience, we entered only an hour's worth at a time. The off-line text editing capability of the Decwriter was used to check and correct errors in the data entry. After checking and correcting any errors, each hour's worth of data was output to a cassette tape and the memory cleared for entering another hour's worth of data. The format used in entering the three types of data is described in Tables 2.16, 2.17, and 2.18.

Several hours' worth of data were accumulated on a cassette. The entire data sample required fourteen cassettes. The cassette data

were input to mass storage files on a Decsystem 10 computer. A FORTRAN 10 program was written and implemented on the Decsystem 10 to convert the data from the fast entry format to the format required by the CFAS. The CFAS formatted data were then output to nine track binary tapes which could be read by the Univac 1106 on which our version of the CFAS is implemented.

Using the procedure outlined above a data base consisting of 9100 reports was created for analysis and use in this study.

TABLE 2.16 Format for Fast Entry of Service A Airways Data

Line	Data List
1	MMdd, HHmm
2	III, T _y , N _C , N _w , V
3 to 3 + N _C -1	hhh, N _S , h _C
3 + N _C	W ₁ , W ₂ ,W ₈
3 + N _C + 1	PPP, TT, T _d T _d

MMdd - Four digit date code MM = Month of year, 01-12
dd = Day of month, 01-31

HHmm - Four digit time code HH = Hour of day, 00-24
mm = Minute of hour, 00-59

III - Three letter station identifier

T_y - Type code A = SA, hourly airways
S = SP, special

N_C - Number of cloud layers reported, enter 1 if a clear sky

N_w - Number of weathers

V - Visibility in miles, fractions coded as a floating point decimal

hhh - Height of base of cloud layer in hundreds of feet

N_S - Literal description of cloud cover in the layer, i.e. OVC, SCT,
BKN, CLR

TABLE 2.16 (Continued)

h_c - Ceiling layer designator, blank if not a ceiling layer
M if a measured ceiling layer
E if an estimated ceiling layer
MV or EV if the ceiling layer is variable

W_1, W_2, \dots, W_8 - Present weathers as per CFAS code Appendix II
Table II - I Ref. 1

PPP - Pressure, mb

TT - Temperature, °F

$T_d T_d$ - Dew point temperature, °F

Consecutive commas ',,' are used to indicate missing data items.

TABLE 2.17 Format for Fast Entry of Service C Synoptic Data

Line	Data List
1	MMdd, HHmm
2	III, T _y , N _C , N _w , VV
3	N, N _h , C _L , h, C _M , C _H , W
4	ww
5	PPP, TT, T _d T _d

MMdd - Four digit date code, as described in Table 2.16

HHmm - Four digit time code, as described in Table 2.16

III - Three letter station identifier

T_y = C for synoptic data

N_C = Number of layered cloud groups. This number was 0 for all of the synoptic messages in our data set

N_w = Number of weathers, equal to 1 for all of the synoptic messages in our data set

PPP = Pressure, mb

TT = Surface temperature, °C

T_dT_d = Dew point temperature, °C

N, N_h, C_L, h, C_M, C_H, W and ww are described in Table 2.5

Consecutive commas ',,' are used to indicate missing data items.

TABLE 2.18 Format for Fast Entry of Radiosonde Data

Line	Data List
1	MMdd, HHmm, III, T _y
2 to L _t + 1	PPPP, hhh, TT, T _d T _d

MMdd - Four digit date code, as described in Table 2.16

HHmm - Four digit time code, as described in Table 2.16

III - Three letter station identifier

T_y = R for Radiosonde Data

L_t = Number of levels of data

PPPP = Level pressure, mb

hhh = Level height, m

TT = Level temperature, °C

T_dT_d = Level dew point, °C

Consecutive commas ',,' are used to indicate missing data items.

3 UTILITY PROGRAM

3.1 PURPOSE AND DESCRIPTION

Numerous special purpose or utility programs were created for use in performing specific tasks in the sensitivity study and demonstration run. The purpose and description of each of these programs together with a listing is given in the subsections which follow. Each subsection title states the name of the main program which is described therein together with associated subprograms. The system on which the programs were implemented is indicated. The program listings are given in the appendix.

3.1.1 Program COLUMN (Decsystem 10)

Program COLUMN reformats the printout of data via the fast entry format. The reformatting done by COLUMN results in the data being output five columns to a page rather than one column as on input. This intermediate reformatting was done to facilitate error checking.

3.1.2 Program CONVER (Decsystem 10)

Program CONVER derives the relative UTM coordinates of each station in the data sample and generates the FORTRAN codes used in subroutine CONVRT which convert the three letter station code to relative UTM coordinates. Program CONVER utilizes subroutine UTM and requires the specification of the longitude and latitude of the southwest corner of the CFAS window and the central meridian of the window.

3.1.3 Program SYNOP (Decsystem 10)

Program SYNOP converts Service C Synoptic data from the fast data entry format to the format readable by the CFAS. Subroutine CONVRT is called by SYNOP to supply the relative UTM coordinates for the stations which are identified in the fast data entry format by their call letters.

3.1.4 Program AIRWAY (Decsystem 10)

Program AIRWAY converts Service A Airways reports from the fast data entry format to the format readable by the CFAS. Subroutines CLOUDS and WHETR are called by AIRWAY to convert the cloud and weather data from the fast data entry to the CFAS format. Subroutine CONVRT is called by AIRWAY to supply the relative UTM coordinates for the stations which are identified in the fast data entry format by their call letters.

3.1.5 Program .NEWUTM (Univac 1106)

Program .NEWUTM derives relative UTM coordinates for all stations in the data base. The latitude and longitude of the southwest corner of the window, as well as the central meridian are contained in a data statement. Subroutine .UTM is called by .NEWUTM to calculate the UTM coordinates. Program .NEWUTM was used in finding the optimal location of the CFAS window, i.e. a location which would maximize the number of stations included within the window and its border.

3.1.6 Program .CFMAIN/STAT1 (Univac 1106)

Main program .CFMAIN/STAT1 and subroutine .EXEC1/STAT1 which are modifications of .CFMAIN and EXEC1, respectively, were used to interpret at one time the airways, synop, and RAOB observations constituting the complete data set for the statistical analyses and sensitivity evaluations of the CFAS. The interpreted observations are output to a mass storage file to be subsequently accessed by the routines which create the reduced or fractional density data sets.

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SENSITIVITY STUDY OF CFAS AND CFAR OBJECTIVE ANALYSIS TECHNIQUE--ETC(U)

FEB 79 W D MOUNT, B R FOW, B D MOUNT

DAEA18-76-C-0060

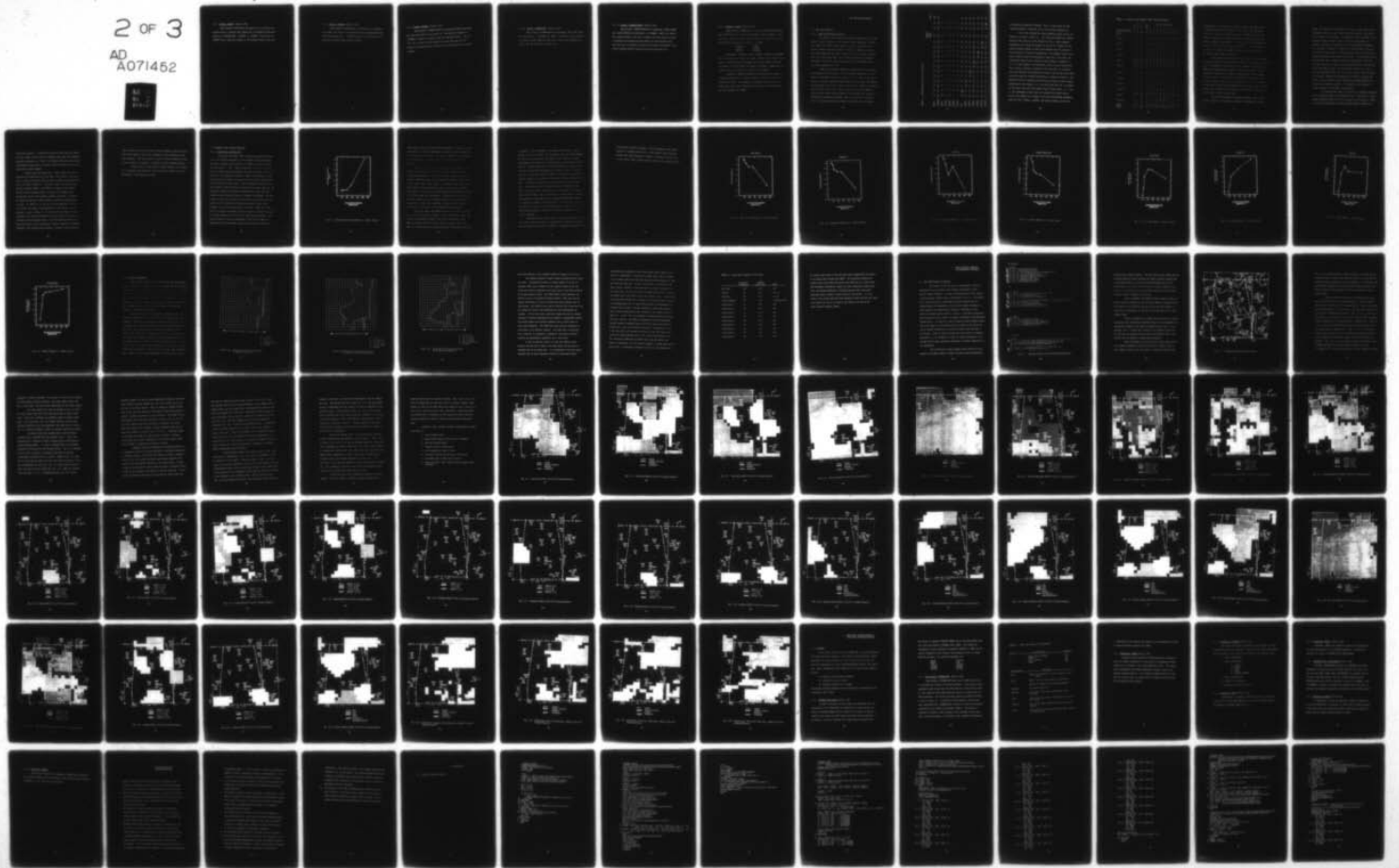
ERADCOM/ASL-CR-79-0060-1

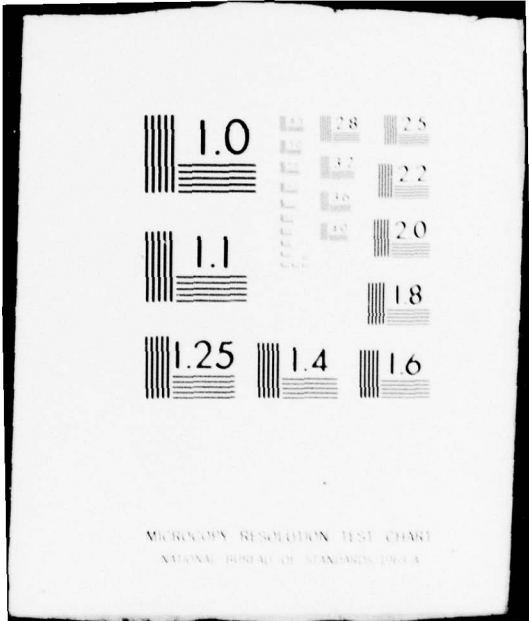
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NATIONAL BUREAU OF STANDARDS-1963-A

3.1.7 Program .INTPRT (Univac 1106)

Main program .INTPRT reads and prints out in a concise and readable format a selected mass storage file of interpreted observations created by .CFMAIN/STAT1, .OBSTIM, or .STDENS. The purpose of .INTPRT was to verify the contents of the fractional density data sets.

3.1.8 Program .OBSTIM (Univac 1106)

Main program .OBSTIM reads a selected file of interpreted observations and sends to an assigned file those observations taken between specified times. .OBSTIM was used to create data sets of observation spanning particular time periods.

3.1.9 Program .STDENS (Univac 1106)

Main program .STDENS creates the fractional density and silent area data sets from the full density set. The procedure employed in .STDENS is specific to stations within the "Alabama Square". The 3/4, 1/2, 1/4, 1/8 and 1/16 full density and silent area data sets are created by deleting from the full data set the observations from specific stations.

3.1.10 Program .CFMAIN/IJFL (Univac 1106)

Main program .CFMAIN/IJFL and subprogram .EXEC1/IJFL which are modifications of .CFMAIN and .EXEC1, respectively, were designed to create the IFILE, JFILE and BASE file for each of the fractional, as well as the full and silent area data sets.

3.1.11 Program .CFMAIN/TSK3RI (Univac 1106)

Main program .CFMAIN/TSK3RI and subprograms .EXEC1/TSK3RI and .EXEC2/TSK3RI are modifications of .CFMAIN, .EXEC1 and .EXEC2. The modified routines were used to perform only the functions involved in analyzing the observations and creating the cloud-fog data base. This was done to facilitate the rapid and economical evaluations of the results obtained with the fractional and silent area data sets.

3.1.12 Program .CFSTAT (Univac 1106)

Main program .CFSTAT reads in a user selected cloud-fog data base (CFDB) from mass storage and calculates various statistics of the sky cover, ceiling, visibility, present weather and layered cloud cover. The following subprograms are called by .CFSTAT:

.CEILING	.STATPK
.COVER	.VISIBL
.LAYERS	.WEATHR

Subprograms .CEILING, .COVER, .LAYERS, .VISIBL and .WEATHR scan, respectively, the values of ceiling, total sky cover, layered cloud cover, visibility and present weather stored in the CFDB to determine the number of missing entries and sends to subprogram .STATPK the non-missing entries from which the statistics are calculated.

Subprogram .STATPK calculates the mean value and variance of a specific parameter (i.e. ceiling, visibility, etc.) for a selected and ground truth CFDB. The covariance, correlation coefficient and root mean square error of the parameter with respect to ground truth CFDB are also calculated by .STATPK.

4.1 ALL DATA ANALYSES

4.1.1 CFAS Control Parameter Effects

An analysis was performed to determine sensitivity of the CFAS analysis output to changes in user inputted control parameters. All data for 7 March 1977 0026Z and the previous 12 hours were used in the control parameter sensitivity analysis. Table 4.1 contains a matrix of the control parameters and values used for each of 15 separate computer runs. The ground truth values of the control parameters are identified separately in the table. Each run was made by systematically varying one control parameter at a time.

Rather than attempt a subjective comparison of one map output with another for the many runs, a set of objective methods was used to provide a quantitative measure of "goodness of fit". Three such methods were used, namely, correlation coefficient, root mean square error (RMSE), and percentage of grid points missing. Each of these methods was applied to the 400 grid points for the analysis window encompassing Alabama. Only those grid points where an analysis was possible were included in computing the correlation and RMSE. The grid point where an analysis was not possible (missing) were tabulated separately and a percentage

TABLE 4.1 CFAS Parameter Values and Variations

	Ground Truth Values												Units				
TIME	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	min
TYMOLD	720	720	720	720	720	720	720	720	720	720	720	720	720	720	720	720	min
NSSQ	<u>2</u>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
ISSQ(1)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
ISSQ(2)	<u>4</u>	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
ISSQ(3)	-	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
ISSQ(4)	-	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
DSP	50	<u>150</u>	50	50	50	50	50	50	50	50	50	50	50	50	50	50	km
DIST(1)	20	20	<u>10</u>	40	20	20	20	20	20	20	20	20	20	20	20	20	km
DIST(2)	80	80	80	80	<u>40</u>	160	80	80	80	80	80	80	80	80	80	80	km
DIST(3)	100	100	100	100	100	<u>100</u>	100	100	100	100	100	100	100	100	100	100	km
TYMC(1)	50	50	50	50	50	50	<u>25</u>	100	50	50	50	50	50	50	50	50	min
TYMC(2)	120	120	120	120	120	120	120	120	120	120	<u>60</u>	240	120	120	120	120	min
TYMC(3)	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	<u>75</u>	300

of missing grid points was computed. Thus, a single value for each method represents a "goodness of fit" for the entire analyzed map.

Let us now consider the control parameter values used in the analyses, as shown in Table 4.1. The TIME and TYMOLD are constant values for the entire run series because the time to start accepting observations was always 30 minutes into the day of 7 March 1977 (to include specials reported at 0026Z) and extended back 720 minutes in time (12 hours) to include old observations. Two different patterns were used to search squares for observations surrounding a grid point. The ground truth values had four possible search squares to implement, 1, 2, 3, or 8 grid squares. All observations within one grid square would first be used in deriving an analysis at the grid point. If no observations were obtained, the program would index to the second search square value and search for available observations to perform an analysis. This procedure would be repeated until the maximum number of search squares allowable had been attained, i.e. 8 for the ground truth run. A separate run was made using only two possible search square values, i.e. 1 and 4. The performance of this latter run compared with ground truth is shown in the bottom row of Table 4.2 for four meteorological parameters, total sky cover, ceiling, visibility, and present weather, and for the

TABLE 4.2 Results Using Variable CFAS Control Parameters

	Sky Cover	Ceiling	Visibility	Present Weather	Cloud Cover in Nine Layers								
					1	2	3	4	5	6	7	8	9
Correlation Coefficient	.93	.84	.77	.68	.87	.80	.78	.76	.73	.69	.77	.75	.73
% of Grid Points Missing	0	0	0	0	0	0	0	0	0	0	0	0	0
RSME	11	64	6184	22	14	22	23	27	34	32	23	24	25
DSP=150													
DIST(1)=10	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
DIST(1)=40	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
DIST(2)=40	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
DIST(2)=160	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
DIST(3)=50	.98 0 4.6	.97 0 21.5	.98 0 1435.5	.99 0 3.1	.99 0 3.6	.99 0 4.4	.98 0 4.9	.99 0 4.5	.98 0 6.4	.98 0 7.7	.98 0 5.6	.98 0 5.4	.98 0 5.1
DIST(3)=200	.99 0 3	.98 0 18	.99 0 766	.97 0 5	.99 0 1	.99 0 1	.99 0 2	.99 0 2	.99 0 3	.99 0 4	.99 0 3	.99 0 3	.99 0 4
TYMC(1)=25	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
TYMC(1)=100	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
TYMC(2)=60	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
TYMC(2)=240	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
TYMC(3)=75	.99 0 1	.99 0 1	.99 0 114	.99 0 2	.99 0 1	.99 0 1	.99 0 1	.99 0 1	.99 0 1	.99 0 1	.99 0 1	.99 0 1	.99 0 1
TYMC(3)=300	1 0 1	1 0 1	1 0 39	1 0 0	1 0 1	1 0 1	.99 0 1	.99 0 1	.99 0 1	.99 0 1	1 0 1	1 0 1	.99 0 1
NSSQ=2	.94	.92	.94	.95	.93	.90	.90	.93	.93	.93	.93	.91	.89
ISSQ(1)=1	2.7	5.	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	6.5
ISSQ(2)=4	8	38	2926	7	9	13	14	13	14	14	13	14	15

percent cloud cover within the nine layers specified in CFAS to cover the altitude range from the surface to 3000 meters. The correlation coefficient, percent of missing grid points, and RMSE values are presented in that order for each meteorological parameter associated with NSSQ=2, ISSQ(1)=1 and ISSQ(2)=4. For sky cover, the correlation was 0.94, the percent missing grid point data was 2.7 and the RMSE was 8 percent. The units of the RMSE for each meteorological variable is the same as those listed in Table 1.1.

Notice that of all the runs, the only time it was not possible to obtain an analysis at a grid point was when only two search squares were used. A degradation is also shown via the correlation coefficient and RMSE for all meteorological variables. The average Univac 1106 time to complete an analysis was 3 minutes for all data and 4 search squares. By having only two search values the computer time necessary for conducting an analysis was reduced by 18 percent. Thus, it is possible to reduce the computer time significantly by varying the number of search squares. The results do show, however, that care must be exercised in the choice(s) of search square values.

The effect of changing the distance parameter, DSP, from 50 to 150 km had the most pronounced influence on changing the analysis

output. The purpose of this parameter is to form a single "best report" on weather observed by two or more very close stations, those within a DSP distance of one another. The advantage of this parameter in the objective analysis scheme is that it allows an operationally more important observation to supersede a less critical nearby observation. This procedure is applied on a variable by variable nature so that the "best report" could contain a ceiling observation from one station and a visibility observation from another close station. The intent was to use this procedure only to handle simultaneous observations in time that were also very close in space, say within, plus or minus, one grid unit of the final analysis mesh. From the results in Table 4.2 it can be seen that increasing DSP to 150 km or, plus or minus, three grid units is too coarse. Although this parameter has no effect on missing grid points, it does provide the worst correlation and largest RMSE for all thirteen listed weather variables. It is clear that this parameter is vitally important to the quality of the analysis.

The standard DSP value of 50 proved to be perfectly acceptable for the data dense region of southeastern U.S.A. There were no "dual" stations reporting within 50 km of one another for this region so a DSP of 50 was the best value to select to provide spatial resolution for

ground truth analyses. A question that does not arise with this normal type data sample but that could be important under close and conflicting battlefield observations is, what is the optimum DSP value that provides discrimination among reports, maintains spatial resolution, yet emphasizes operationally critical features?

Distance and time scale factors, used to weigh the value or influence of an observation on a grid point, were varied to allow for a range of values from half as small to twice as large as the ground truth value, as shown in Table 4.1. The first, second, and third distance and time constants (DIST () and TYMC ()) appear in the analysis scheme to treat convective (local), convective with middle clouds (mesoscale), and all other weather conditions separately. In general, the sphere of influence of local weather is limited to small distances and time, i.e. DIST (1) = 10, 20, or 40 km and TYMC (1) = 25, 50, or 100 minutes. The range of the mesoscale and other distance and time constants is given in Table 4.1. It can be seen from Table 4.2 that variations in the local and mesoscale distance and time constants have no effect upon the analysis results. The third distance and time constants that applied to all non-convective weather situations did produce variations in the computer output analyses. However, these differences

were extremely small for all variables except visibility, which should be looked into further in view of the importance of this parameter to many Army operations. The main point to be made is that the analysis results are not sensitive, nor critical, to distance and time weighting factors.

Overall it can be stated that no violent changes in the analysis due to changing input parameters were detected that would indicate any instabilities in the analysis procedures.

4.2 VARIABLE DATA DENSITY ANALYSES

4.2.1 Correlations and RMS Errors

The ground truth CFAS control parameters described in section 4.1.1 were applied separately to every available station observation and then to variable station densities to perform a series of analyses for 0026Z March 7, 1977. Maps showing full, $3/4$, $1/2$, $1/4$, $1/8$, and $1/16$ station density distributions are given in Figures 2.12 to 2.17, inclusive. The correlation coefficient, RMSE, and percentage of grid points missing an analysis were derived for each station density using the full data set as ground truth. These computations were made for each analysis of the 400 inner grid points that encompass Alabama. The correlation coefficient and RMSE computations were made only with respect to those grid points where an analysis was possible. The percentage missing value accounts for the number of grid points where an analysis was not possible even though the maximum search square available for use was eight grid units or 200 km. Figure 4.1 shows that the percentage of missing grid points remains essentially zero until an average distance of 300 km or more exists between stations. This average distance of 300 km corresponds to only $1/8$ the number of stations where all are included. These missing grid point results are

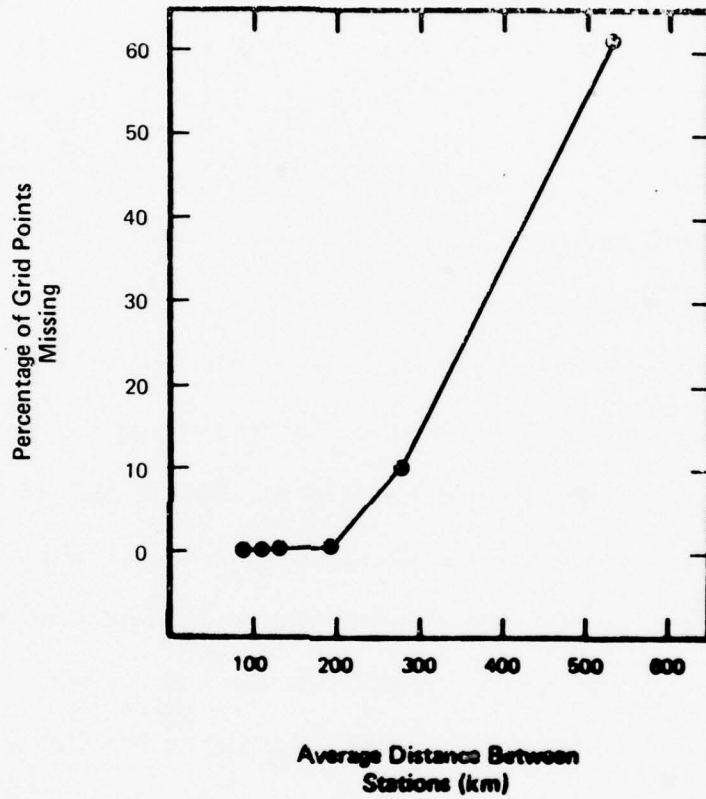


Fig. 4.1 Missing Grid Point Analyses vs. Station Density

independent of the type of meteorological variable. It can also be seen from Figure 4.1, that the CFAS analysis program, using a maximum of eight grid unit search squares, can force an analysis at more than 90% of the grid points even though only 1/8 the original stations are available.

Figures 4.2 to 4.5 show the decay of the correlation as distance between stations increases. These results were obtained for four meteorological variables, sky cover, visibility, ceiling, and present weather. All decay curves are reasonably well behaved except for one or two points on the ceiling display. In general, as the average distance between stations doubled from 100 to 200 km, the correlation coefficient for sky cover and visibility dropped to 0.7 which means that 50% of the variance was unexplained. Conditions are even worse for analyzing ceiling and present weather variables from limited weather observations. In this case a doubling of distance between stations resulted in only about 16% of the variability being explained.

Root mean square error (RMSE) results are presented in Figures 4.6 to 4.9 for sky cover, visibility, ceiling, and present weather. All of these meteorological variables show a rapid deterioration in the RMSE as distance between observing stations increases from 100 to 200 km. Beyond that point, deterioration either slows down, levels off,

or improves. The worst RMSE is 20 percent for sky cover, 1 km for ceiling, 13 km for visibility, and 30 category units for present weather. The impact of data density on the quality of the analysis is shown graphically by the rapid decay or deterioration as observational densities decrease. Another factor that is adversely affected as station density decreases is the increased running time required to make a computer analysis. It was found that the computer execution time to perform an analysis doubled as the number of observation stations decreased by a half. To state this another way, less data requires longer computer runs. The reason for this is the fact that the computer takes more time to search the area. This increases as the square of the distance to the nearest station, and, in the process, a larger number of distant observations are found that must be interpreted and weighted properly to complete the analysis at each grid point. It is possible to minimize this time effect for any given data distribution by selecting less stringent CFAS control parameters, such as the number and interval of search squares allowable.

Although all data density analyses, including silent area, used only routine surface and upper air observations, it should be mentioned that the CFAS has the built-in capability to incorporate pilot reports and

meteorological satellite information. Such observations could greatly improve the available data density. At the present state-of-the-art, satellite data would definitely be helpful in improving sky cover and, to a far lesser extent, present weather, ceiling, and visibility results.

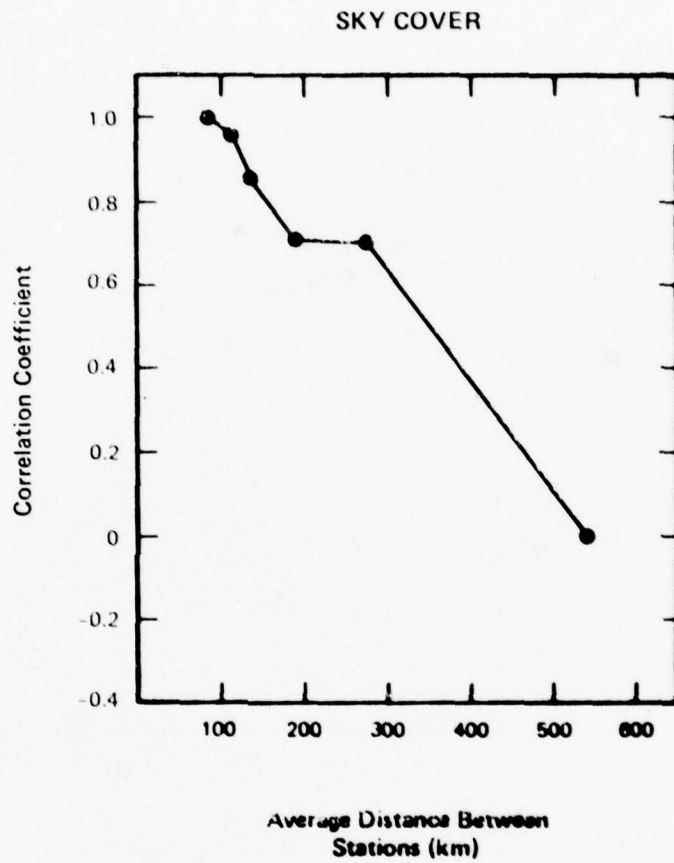


Fig. 4.2 Sky Cover Correlation vs. Station Density

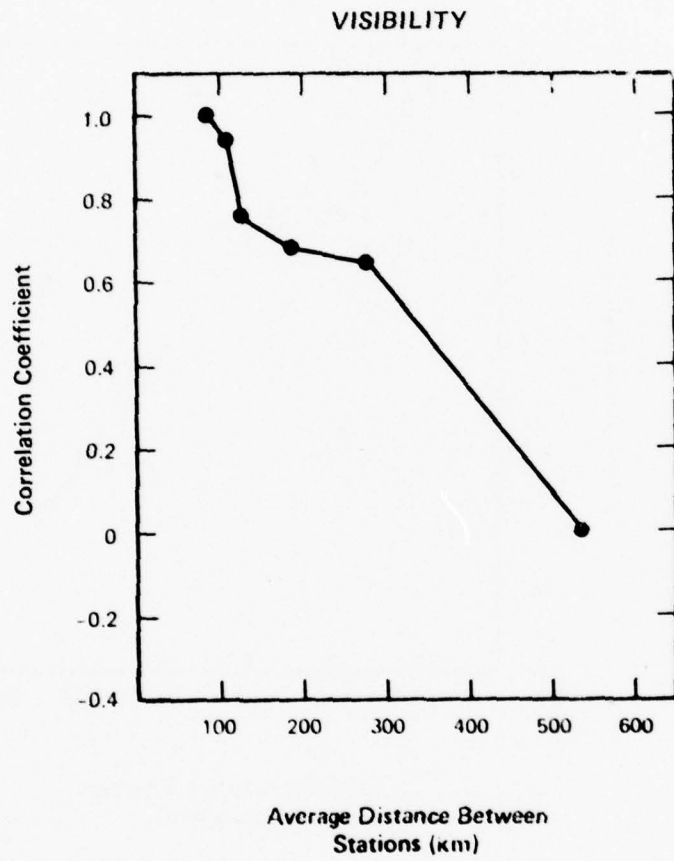


Fig. 4.3 Visibility Correlation vs. Station Density

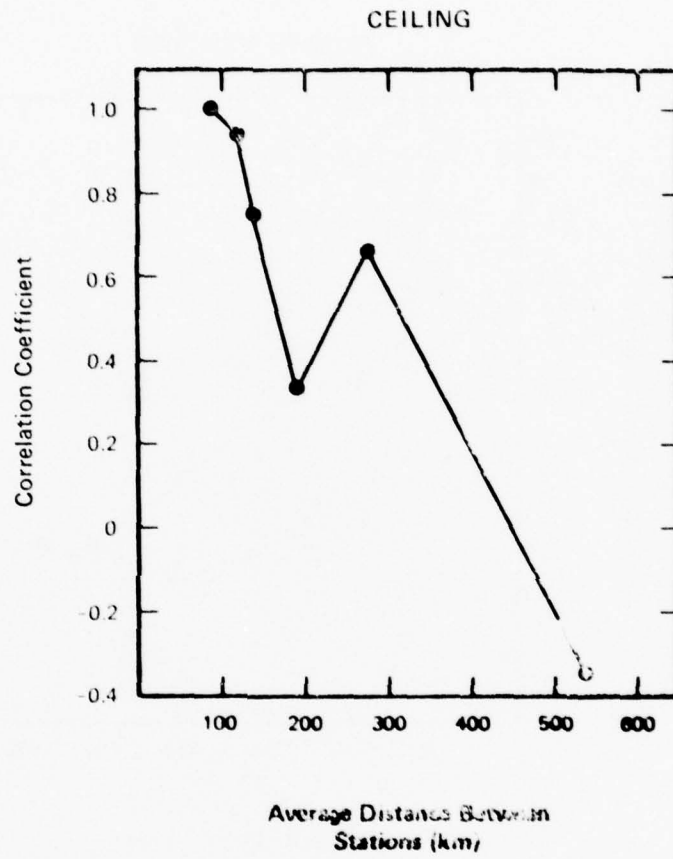


Fig. 4.4 Ceiling Correlation vs. Station Density

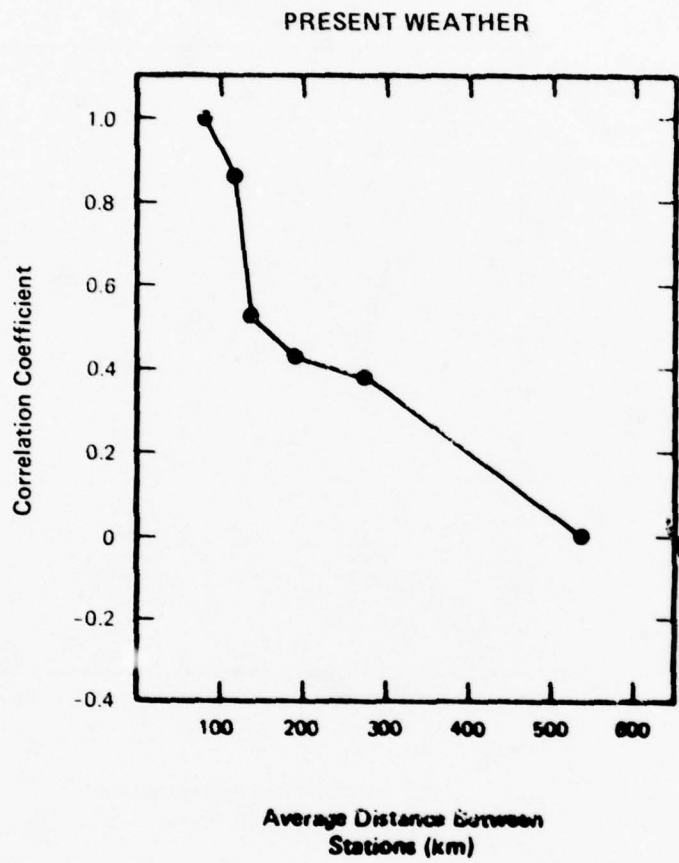


Fig. 4.5 Present Weather vs. Station Density

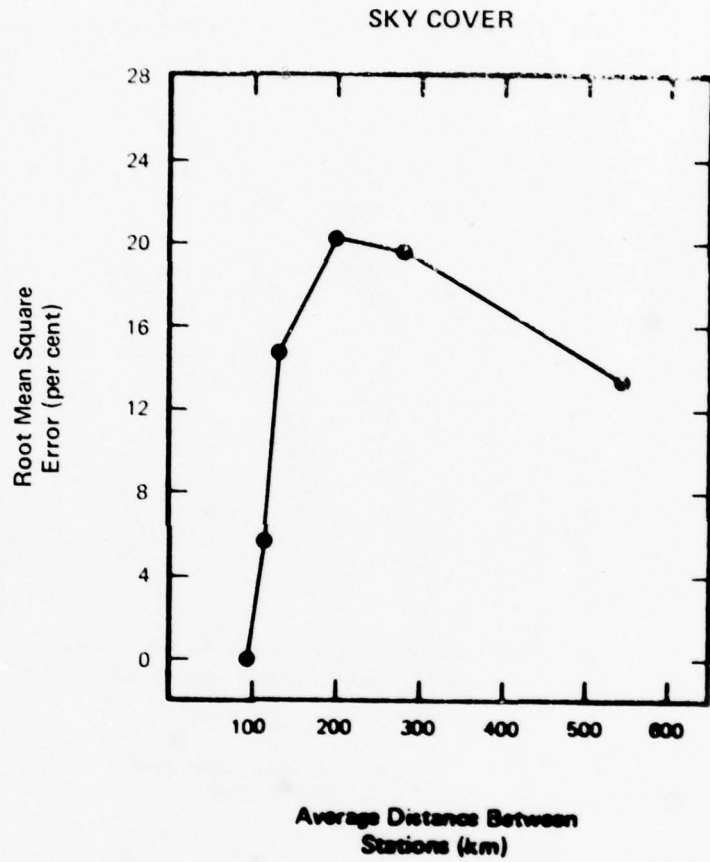


Fig. 4.6 Sky Cover RMSE vs. Station Density

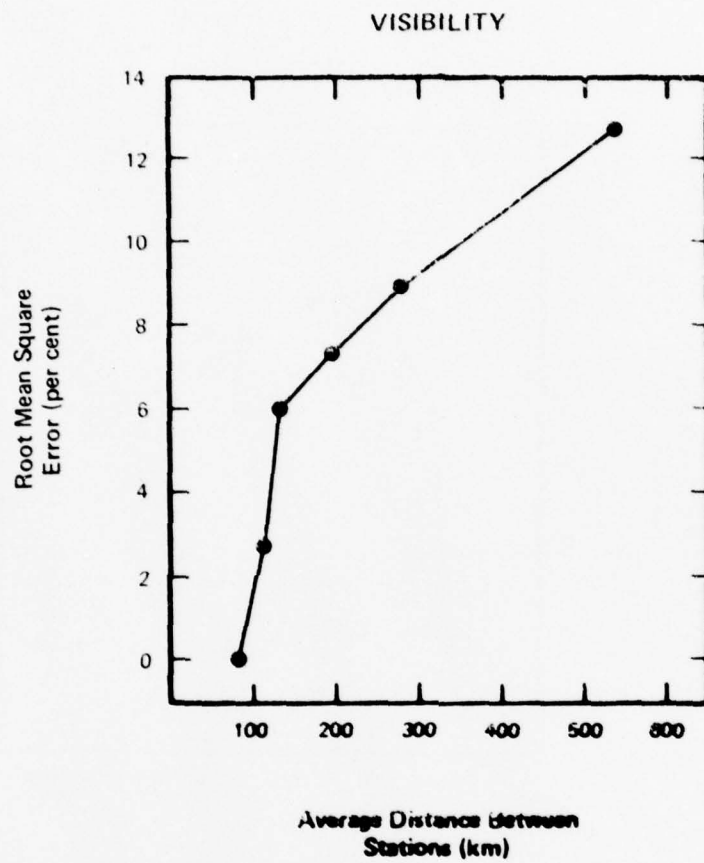


Fig. 4.7 Visibility RMSE vs. Station Density

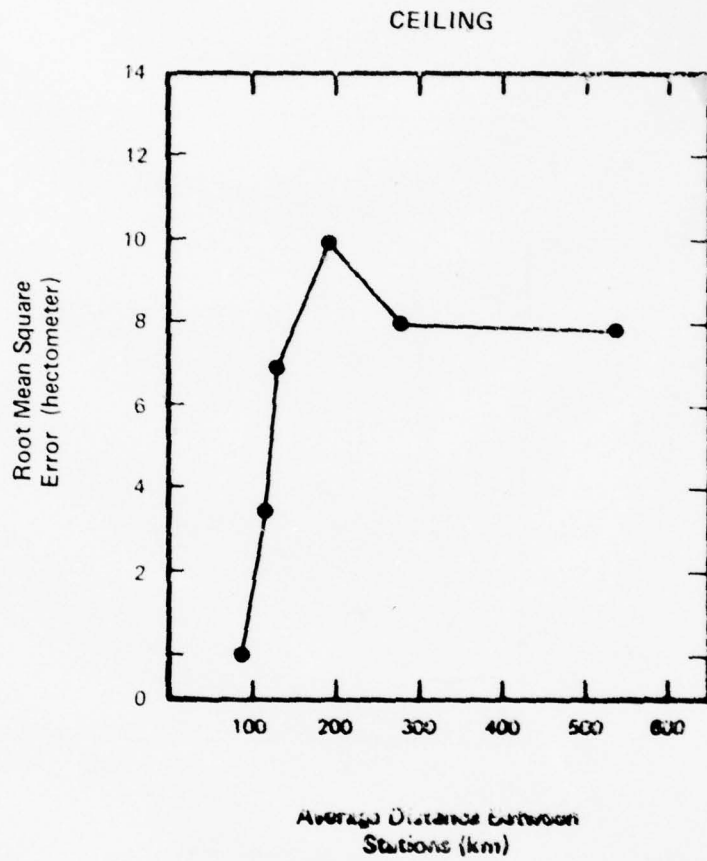


Fig. 4.8 Ceiling RMSE vs. Station Density

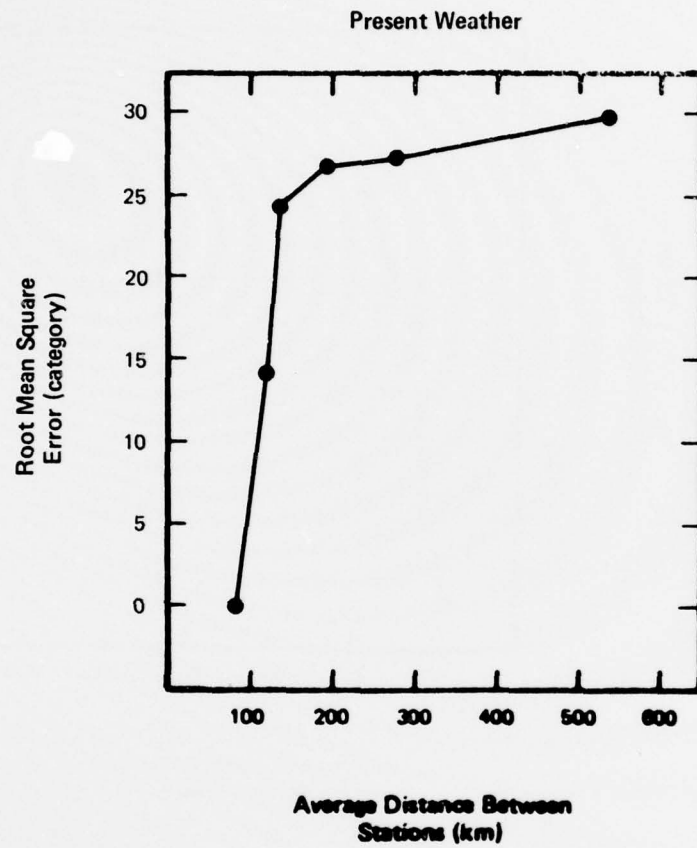


Fig. 4.9 Present Weather vs. Station Density

4.3 SILENT AREA ANALYSES

All observing stations east of a north-south line bisecting the 900 km square window-border region were eliminated from the data base to generate a silent area typical of what could be expected under battlefield conditions. Data from stations west of the demarcation line were used to construct an analysis for each of the 400 grid points contained within the inner 500 km square that encompasses the state of Alabama. The verification map was made from CFAS analysis using all data stations for the entire 900 km square.

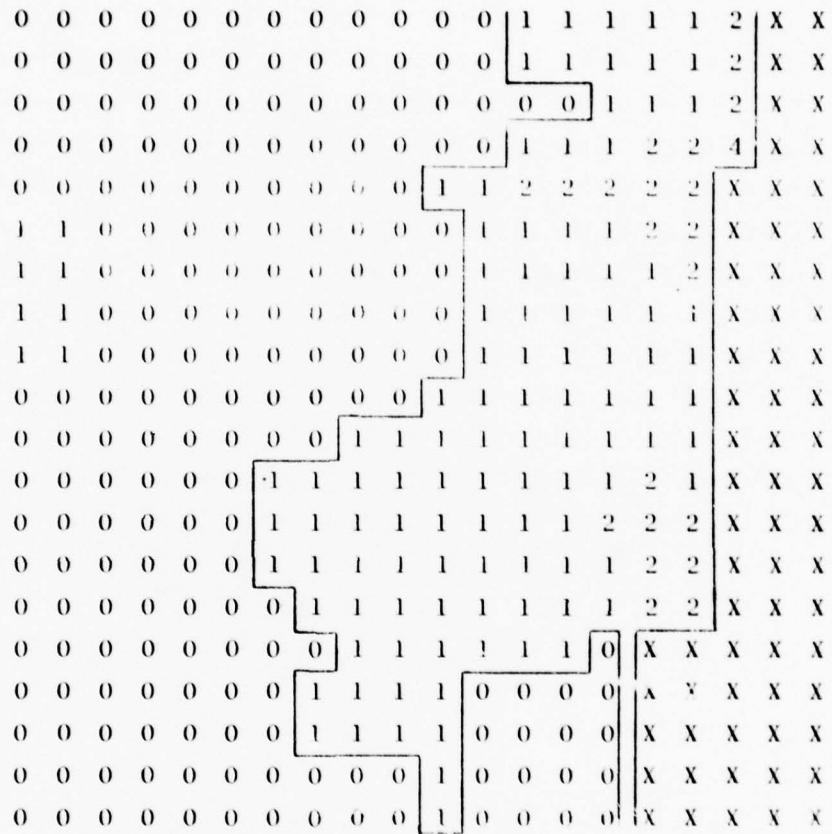
Each grid point error was computed for both the silent area, as well as the data area for sky cover, base of the lowest cloud, and visibility. These grid point errors are shown in Figures 4.10 to 4.12 for discrete error categories shown in the lower right hand portion of the figure. The X sign was used to indicate grid points where an analysis was not possible. Notice that the missing grid point analyses are at the same locations regardless of the meteorological parameter. By referring back to the silent area station distribution shown in Figure 2.18, it can be seen that in the southern part of the map, the nearest stations are considerable distances west of the north-south demarcation line. Influence of this station distribution is shown by more missing

0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	3	X	X	
0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	3	X	X	
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	3	X	X	
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	3	X	X	X		
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	X	X	X		
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	X	X	X
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	X	X	X
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	X	X	X
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	X	X	X	
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	X	X	X	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	X	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	X	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	X	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	X	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	X	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	X	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	X	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	X	

← Data Area | Silent Area →

0 = 0 to 10%
 1 = 11 to 30%
 2 = 31 to 60%
 3 = Greater than 60%
 X = missing

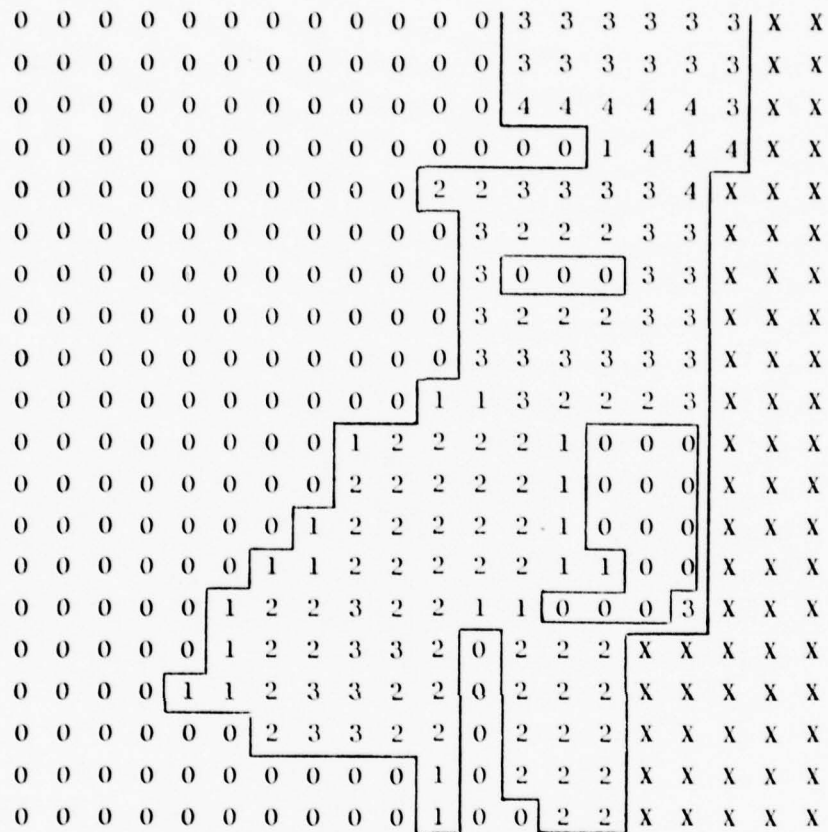
Figure 4.10 Silent Area Grid Point Error Values For Sky Cover (Percent)



← Data Area | Silent Area →

0 = 0 km
 1 = 0.1 to 0.9 km
 2 = 1.0 to 2.0 km
 3 = 2.1 to 3.0 km
 4 = 3.1 to 4.0 km
 X = missing

Figure 4.11 Silent Area Grid Point Error Values For Base of Lowest Cloud (Kilometers)



← Data Area | Silent Area →

- 0 = 0 to 0.5 km
- 1 = 0.6 to 1.0 km
- 2 = 1.1 to 2.0 km
- 3 = 2.1 to 10.0 km
- 4 = Greater than 10 km
- X = missing

Figure 4.12 Silent Area Grid Point Error Values For Visibility (Kilometers)

grid point analyses in the southeast portion of Figures 4.10 to 4.12.

The maximum number of search squares allowable for this study was eight. Increasing the number of search squares to ten for the northeast sector and to thirteen for the southeast sector of the map would have forced an analysis at all grid points so that there would be no missing analysis points. The CFAS search control parameter can always be set as the greatest distance between a grid point and the nearest observation to insure no missing grid point analyses even in silent areas. The further a grid point is removed from a data point and the smaller the scale of the phenomena the more questionable the analysis. On the other hand, some have argued that such an analysis expanded to include climatological and forecast or extrapolated information would produce more reliable estimates than a pilot's guess of silent area conditions. The CFAS can accept forecast information as data inputs to its objective analysis. The CFAS does not presently have, however, the capability to perform its own trend or forecast analysis for extrapolating information into a silent area.

It can be seen from Figure 4.10 that the CFAS sky cover analysis not only has no errors in the data region but also does remarkably well in the silent area. It is interesting to note that neither statement can be made concerning analyses of mesoscale features

associated with visibility or base of the lowest cloud, shown in 4.12 and 4.11, respectively. In both of the latter cases, lack of stations in the southern part of the data area adversely effects analyses in both the silent and data area. It can be stated that, in general, for all three weather variables, results deteriorate as distance increases into the silent area. In fact, the largest visibility error exceeds 10 km and the largest error in the lowest cloud base exceeds 3 km. The importance of having some observations, especially of mesoscale features, can not be overemphasized, and, as discussed previously, reconnaissance or satellite reports would be valuable additions to silent area analyses. This is further emphasized by the "goodness of fit" results shown in Table 4.3. In this table the correlation coefficient, percent of missing grid point analyses, and RMSE are tabulated for nine meteorological variable analyses completed within the 500 km square region that includes half a data rich and half a silent area. A maximum of 18.5% of the grid points were missing an analysis for the first cloud layer, whereas all other variables had a 16.5% missing data analysis rate. The correlation coefficients and RMSE values were the lowest and highest, respectively, for such weather variables as ceiling and layered cloud cover. A correlation coefficient of only 0.31 was obtained for

TABLE 4.3 Silent Area Goodness of Fit Values

	Correlation Coefficient	% Missing Grid Points	RMSE
Sky Cover	.88	16.5	14%
Ceiling	.55	16.5	.96 km
Visibility	.94	16.5	2.9 km
Present Weather	.94	16.5	9 category units
Cloud Layer 1	.31	18.5	23%
Cloud Layer 2	.46	16.7	25%
Cloud Layer 3	.51	16.5	24%
Cloud Layer 4	.61	16.5	31%
Cloud Layer 5	.58	16.5	38%
Cloud Layer 6	.77	16.5	28%
Cloud Layer 7	.91	16.5	15%
Cloud Layer 8	.79	16.5	23%
Cloud Layer 9	.73	16.5	25%

the percent cloud cover in the first layer which extends from the surface to 45 meters above ground level (AGL). The correlation improved for percent cloud cover within the second layer (from 45 to 91 meters AGL) and essentially continued to improve for each successively higher layer. Thus, the greatest difficulty in analyzing percent cloud cover within particular layers occurred in layers closest to the ground. It is precisely in this region that there were fragmented clouds and low scud which drift rapidly into and out of sight of the observer and present the worst objective analysis results.

5.1 MAP DISCUSSION OF RESULTS

The purpose of this section is to demonstrate a variety of capabilities that are possible using computer applications to Army aviation weather problems. In order to appreciate some of the problems, a typical teletype weather report is reproduced in Fig. 5.1. The problem that a pilot encounters in attempting to acquaint himself with the current weather is compounded by the fact that weather information is coded primarily for meteorologists, requires a knowledge of local station call letters and/or numbers, is filed on clip boards according to FAA transmission circuit number, or appears on difficult to read facsimile weather charts. In order for a pilot to obtain the latest weather significant to his flight it is necessary for him to screen or sift through all special weather observations to obtain and decipher those important to his mission. Often on urgent missions and in the hustle of immediate operations it is not possible for a pilot to maintain proficiency in his primary function while maintaining cognizance of weather restrictions on his performance.

The present Army weather support system evolved from extension of the labor intensive concept of having trained meteorologists

AL 071124

MISSING

ANZ CLR 7 227/40/30/0503/019
 BHM CLR 7 238/34/31/3607/023
 DHN EAD BKN 5F 197/49/44/3210/010-DHN>3/6 3/7
 HSV CLR 15 244/35/28/3203/024
 MGM CLR 7 228/42/36/3408/020-MGM>3/11
 MJB CLR 15 231/41/37/3408/022
 MSL CLR 10 249/34/31/2904/026
 TOL CLR 7 237/39/34/3604/025

Q

IA 071125

+ LNA CLR 12 240/33/29/2504/024-LNA>10/8 3/1
 + CHA CLR 12 230/37/28/2103/020
 + CTV CLR 7 202/33/23/3605/217-CTV>2/3
 BYR
 + BRY CLR 12 260/36/27/1403/030-BRY>11/3 1/5 1/10 1/15 2/19 3/5
 + MSL CLR 15 259/32/29/0000/029
 TRI 70 SCT 10 202/36/24/2504/011
 A TYS CLR 15 222/40/26/3304/010-TYS>3/3

44

MS 071126

GLN FIND

GWO CLR 12 261/33/32/0000/030
 JAN CLR 8 260/33/32/3404/030 -JAN>2/10
 MCB CLR 10 257/39/34/0104/029-MCB>3/12
 + MEI CLR 50F 255/35/31/3504/023

Q

SC 071126

MISSING

X MD SP 3 SCT MID OVC 3R-F 167/47/46/0106/003/ RE FT35/ POPN VRY 101
 CAE M6 BKN 19 OVC 4F 163/51/47/3412/001/RE35 CIG RGD
 GHS SP M5 OVC 5L-F 142/52/50/3606/994/CIG RGD
 CRT
 A FLO M40VC 7R- 132/49/49/3509/992 RR35-FLO>1/1 2/16
 GSP M37 OVC 12 170/45/44/0106/004/RE 15

Fig. 5.1 Typically Difficult to Read Teletype Weather Report

providing pilot weather briefings. The time period of the 1980's and the expected available trained personnel and support logistics suggest that an automated method of providing weather information can not only provide better, up to date, and operationally tailored information, but can do so in a manner that greatly reduces manpower while increasing efficiency within a battlefield environment.

A pilot controlled and operated computer weather system can provide upon his command not only the latest update of weather information tailored to his needs but can also provide the past sequence of events and, if necessary, can provide a short-time projection of future weather events.

For any geographical or weather analysis region, the computer can provide such operationally important features as the topography and geopolitical boundaries upon which an analysis can be made. For our purposes, Fig. 5.2 shows these features for the Alabama region where we will focus our attention for this study to demonstrate some of the products that are possible to support Army operations.

Before proceeding to discuss the many figures that describe the computers capability to present time series of weather events or many weather events for one time period, it should be mentioned that

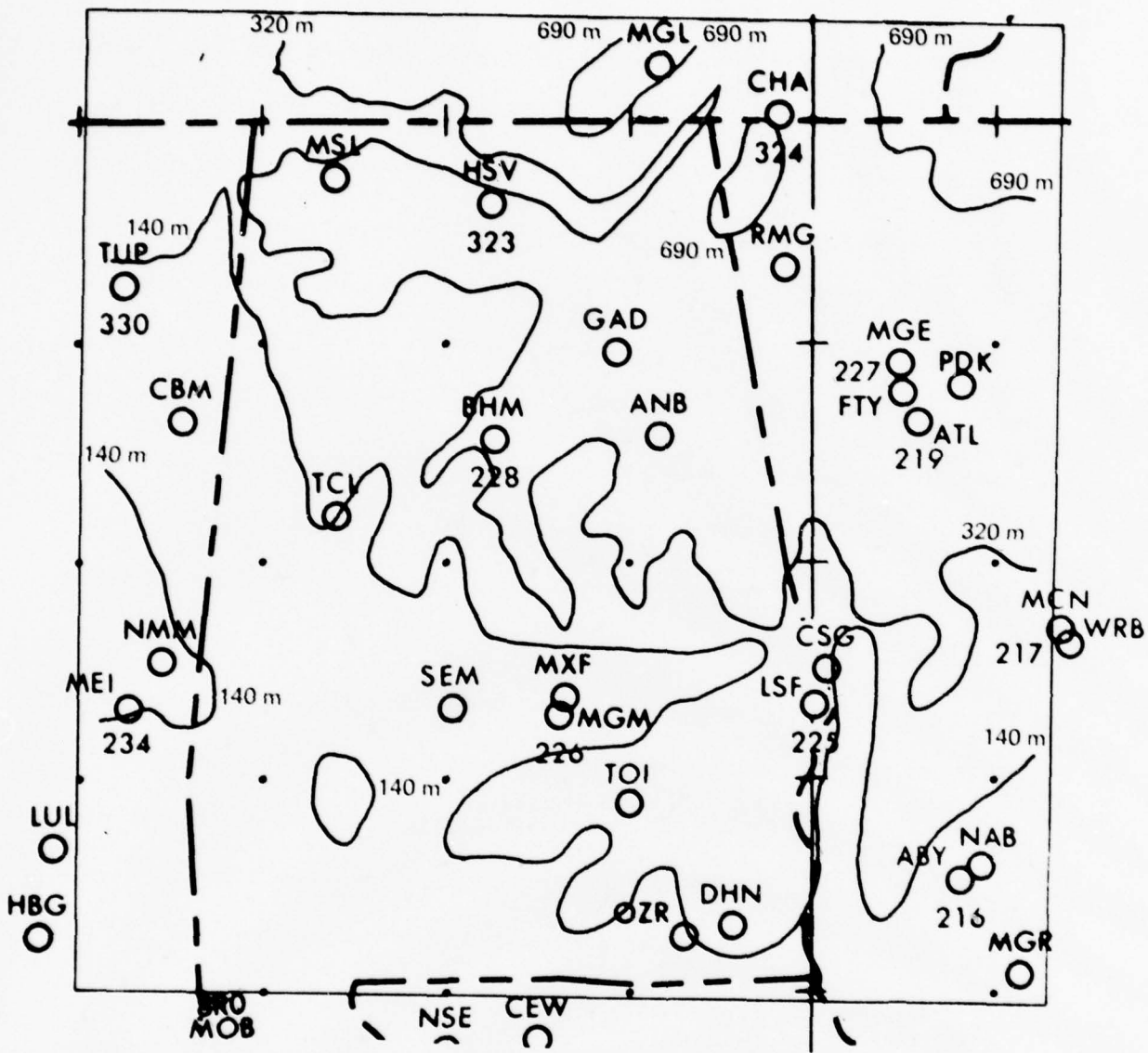


Fig. 5.2 Topography and Geo-Political Features

this is a very limited sample of what is possible. It should also be emphasized that in order for the maximum benefit to be achieved from automated weather applications to Army operations, it is necessary that both the Army operational and meteorological community identify their mutual problems, assign priorities, and work collectively to attain defined goals.

We have selected a time series of meteorological events that would be of interest to aviation personnel. Computer analyses were made at odd times to be more characteristic of pilots interrogating the computer terminal on a random basis. The time series analyses are given for five meteorological variables. Figs. 5.3 to 5.7 present computer analyses of per cent sky cover for five separate times beginning 2130Z 26 February 1977 and ending 0640Z 27 February 1977. Figs. 5.8 to 5.11 present the height of the lowest cloud base beginning 0040Z and ending 0640Z 27 February 1977. Figs. 5.12 to 5.15 present the ceiling height and Figs. 5.16 to 5.19 depict the horizontal visibility at the surface for the same time interval as the lowest cloud base analyses. Fig. 5.20 to 5.24 also cover the same time interval, plus an additional analysis of present weather conditions at 0720Z 27 February 1977. A color code was used for all the analyses to depict

categories of weather conditions. In all cases, red was used to indicate the worst aviation weather conditions, then came yellow, green, and blue, in that order, with white areas representing the best flight weather.

Sky cover analysis for 2130Z 26 February in Fig. 5.3 shows the series begins with most of the area having clear or partly cloudy skies. Only in the southwest and northwest corners do broken clouds exist. Four hours later, Fig. 5.4, spotted regions on the map have overcast conditions but as time progresses, the entire area, as seen in Fig. 5.7, becomes engulfed by nearly an unbroken solid mass of clouds.

The lowest cloud base analysis series shows the detail character that is attainable with the computer system. This is one parameter that is difficult to obtain a mental picture of what exists by reading teletype reports. It is also a parameter that is not routinely analyzed and transmitted on the facsimile circuit. Yet it is a parameter that has value, especially to helicopter pilots that do not have sophisticated instruments to fly in clouds. Notice in Fig. 5.8, there are two small regions where the lowest cloud bases are below 0.15 km. The corresponding sky cover map, Fig. 5.4, shows overcast skies for these same areas but the ceiling map, Fig. 5.12, shows the overcast skies are above 1.2 km. A corresponding map, Fig. 5.16, shows

visibility exceeds 4 km for the same geographical location as those low clouds while the present weather map, Fig. 5.20, shows fair for one and rain for the other location. Thus, by looking at several of these maps for the same time period one can obtain a good mental picture of weather conditions prevailing at a given location. This feature will be demonstrated more in the later discussion on Figs. 5.25 to 5.33. As far as the lowest cloud base map series is concerned, the patchy nature and detail of this variable is clearly illustrated along with its rapid time changes as shown in Fig. 5.8 to 5.11. Field Army flights are frequent but usually less than an hour in duration. Having a system that keeps a pilot "weatherwise" of the latest details would prove valuable in planning and executing a mission.

Categories desired for displaying an analyzed variable can be inputted by the user to provide flexibility in satisfying requirements of different missions. Since most Army flights are flown at altitudes below 1.2 km, the ceiling and lowest cloud height categories were chosen to provide analysis resolution in the lowest layers. A cloud ceiling is only reported for those clouds that cover a sufficient portion of the sky to constitute either broken or overcast conditions. For this reason considerable differences exist between the lowest cloud base

maps and the ceiling time series maps in Figs. 5.12 to 5.15. Very low ceilings, below 0.15 km, remain stationary in the southern part of Alabama while very low ceilings move systematically from west to east across the northern part of the state. Horizontal visibility begins the series exceeding 4 km for all but a small (25 to 50 km) portion of the map, Fig. 5.16. Only the southern part of the state experiences visibilities less than 1 km and for two different reasons. A small strip of low visibilities produced by fog remains static in the southeast corner of the state. Those low visibilities in the southwestern corner of the map, Fig. 5.19, are produced by rain from thunderstorms, as shown in Fig. 5.23. At a glance it is possible to delineate regions of high visibility and to track the movement or stagnation of visibilities within operationally defined categories.

Present weather analyses begin with a touch of snow, rain, and showers or thunderstorms, Fig. 5.20, but most of Alabama is under the influence of fair weather. Three hours later, in Fig. 5.21, the snow in the north has changed to rain, the rain in the south has stopped, thunderstorms remain in the west but begin to appear in the north ahead of the steady rain, and radiational cooling under fair skies has resulted in fog conditions in the southeast corner. An hour and half later, Fig. 5.22, the radiation fog remains, the rain returns in the south and

expands in the north, and showers and thunderstorms ring the northern rain area. After another hour and a half, Fig. 5.23, rain and showers progress southeastward and the radiation fog remains entrenched in the southeast corner. Only 40 minutes later, Fig. 5.24, a 200 km wide band of thunderstorms exists about a northeast-southwest axis extending from CHA (Chattanooga, TN) to MOB (Mobile, AL) while the southeast radiation fog continues to persist. Computer analyses of the latest present weather phenomena should find great acceptance by pilots and prove to be very beneficial.

At any one instant in time, a pilot may wish to view all weather variables that exist within his area of interest. Such a set is provided in Figs. 5.25 to 5.33 for nine weather parameters. The entire state of Alabama has overcast skies, Fig. 5.25, with a good portion of it containing low clouds, Fig. 5.26, whose bases are less than 0.3 km. Although all of Alabama has a cloud ceiling, only the northern and southern portions have ceilings below 0.6 km, Fig. 5.27. It is interesting to note that only southern portions experience low visibilities, Fig. 5.28, produced by fog in the east, rain in the midsection, and showers in the western part of the state, Fig. 5.29.

A pilot may wish to have information tailored to his flight altitude. One such output is presented to show the extent that a

particular flight layer is obscured by clouds. Figs. 5.30, 5.31, 5.32, and 5.33 display the per cent cloud cover as overcast, broken, partly cloudy, or clear for the flight layers from surface to 45 m, 45 to 91 m, 91 to 183 m, and 183 to 305 m AGL, respectively. Notice the detail and structure that is attainable via the computer and how a pilot can quickly assimilate his ability to maintain visual contact within each layer.

A number of other candidate computer output products include such items as:

1. severe weather tracks
2. areas below minimum ceilings and/or visibilities
3. VFR and IFR flight paths
4. vertical sections of flight plans
5. air to ground clear lines of sight
6. best flight plan for not being seen from ground
7. best flight plan for photo recon mission
8. plus many others where weather factors influence Army operations.

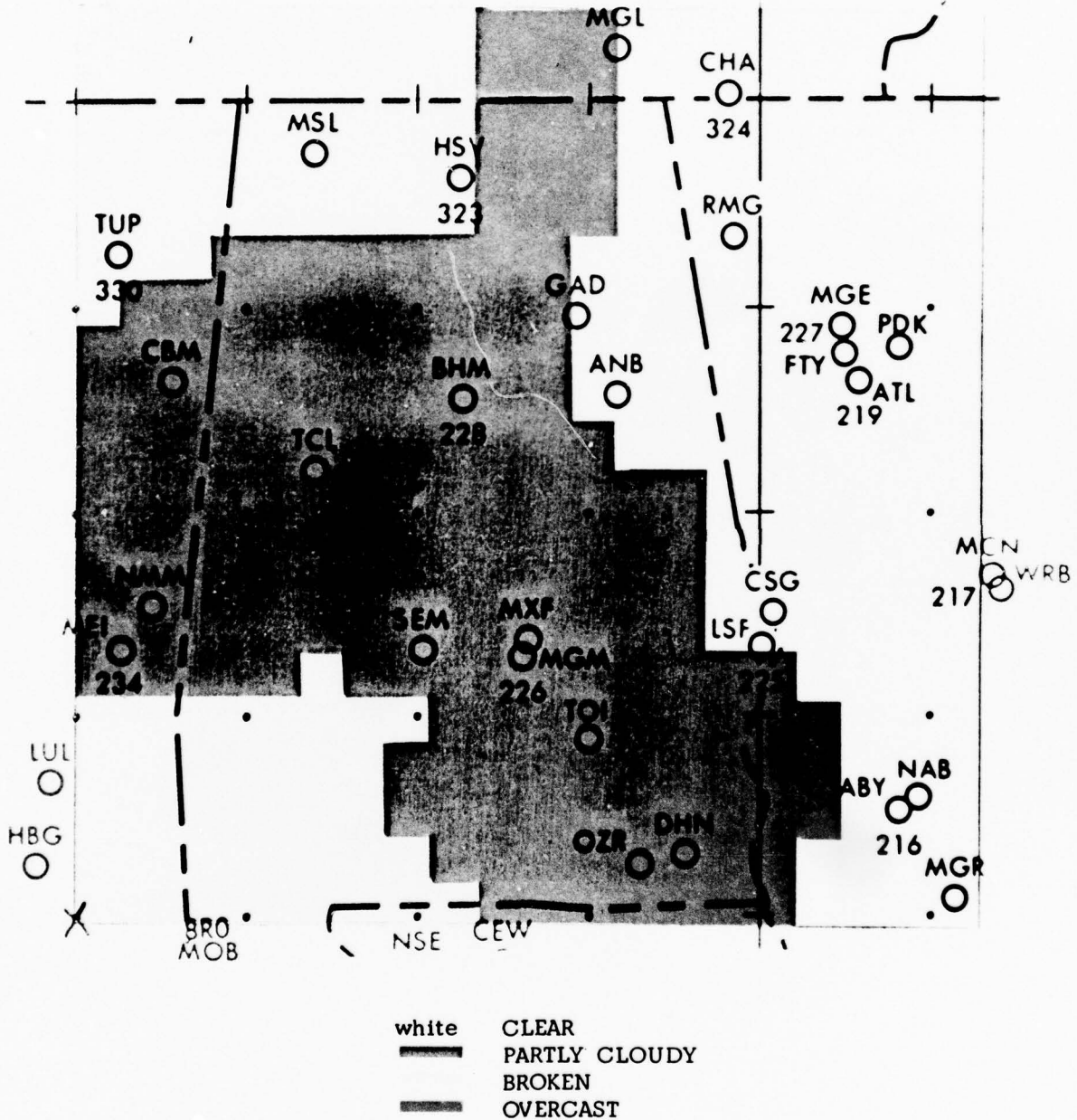


Fig. 5.3 Sky Cover 2130Z 26 Feb 1977 Computer Analysis

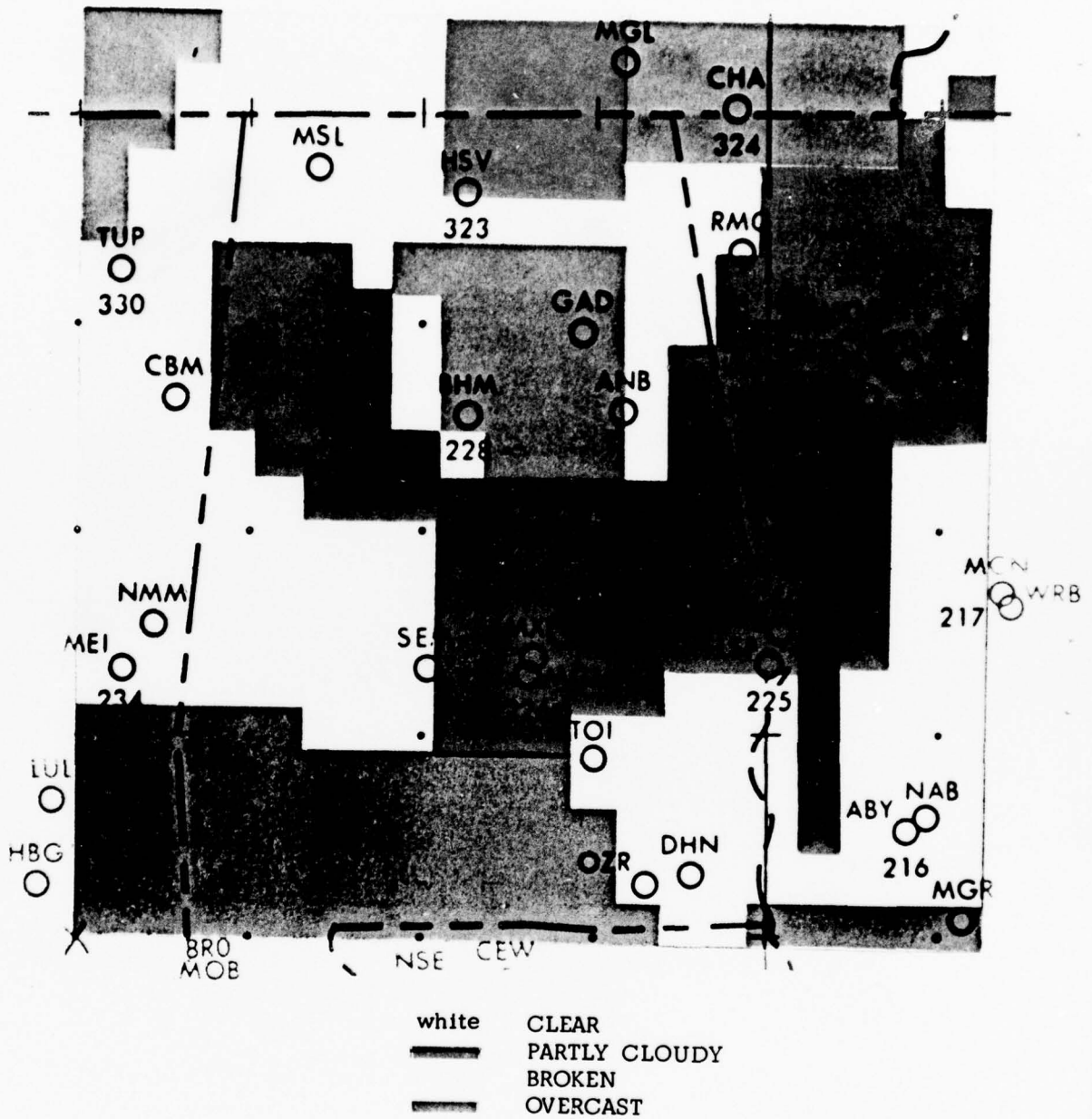


Fig. 5.4 Sky Cover 0040Z 27 Feb 1977 Computer Analysis

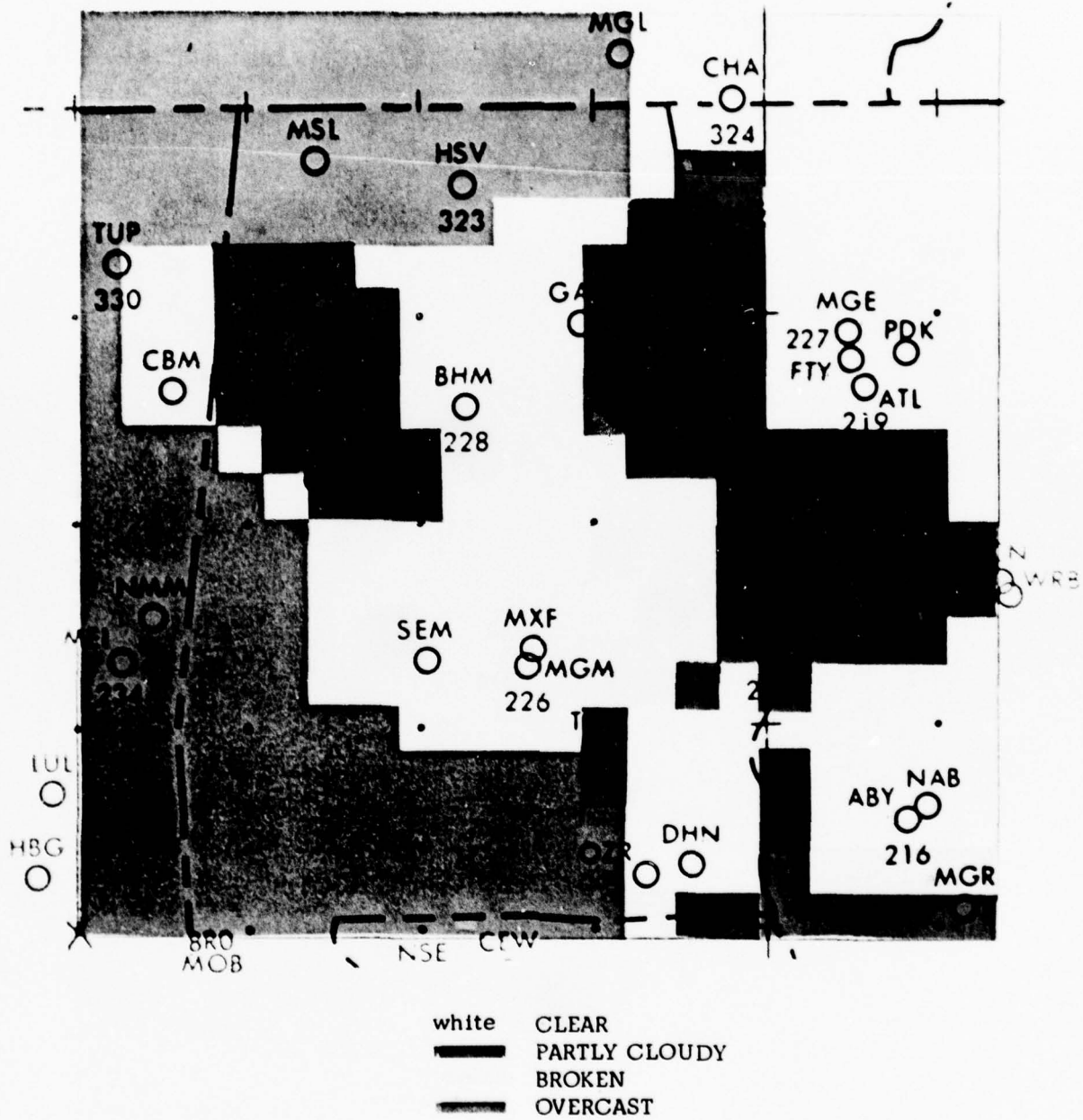


Fig. 5.5 Sky Cover 0340Z 27 Feb 1977 Computer Analysis

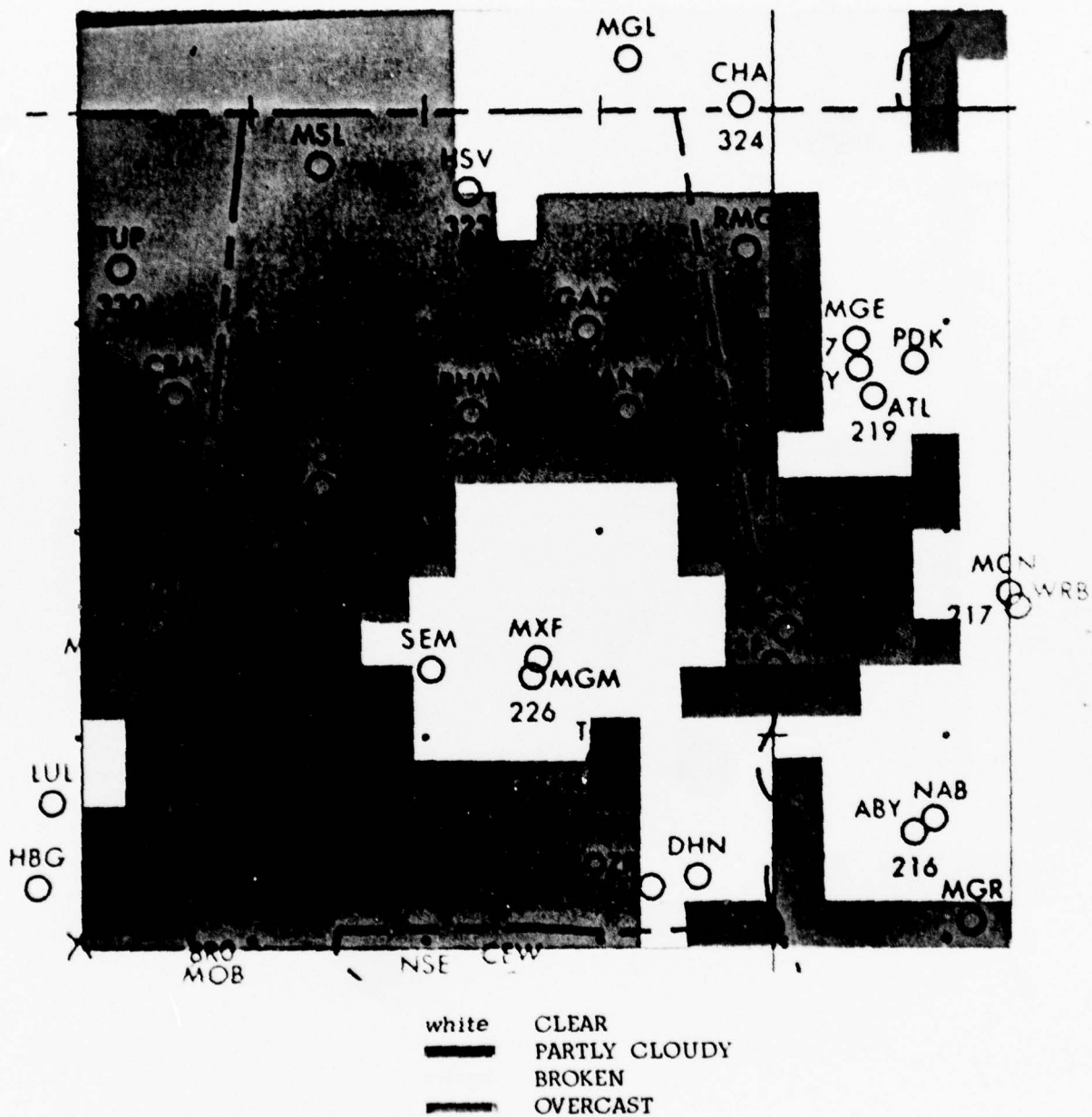


Fig. 5.6 Sky Cover 0510Z 27 Feb 1977 Computer Analysis

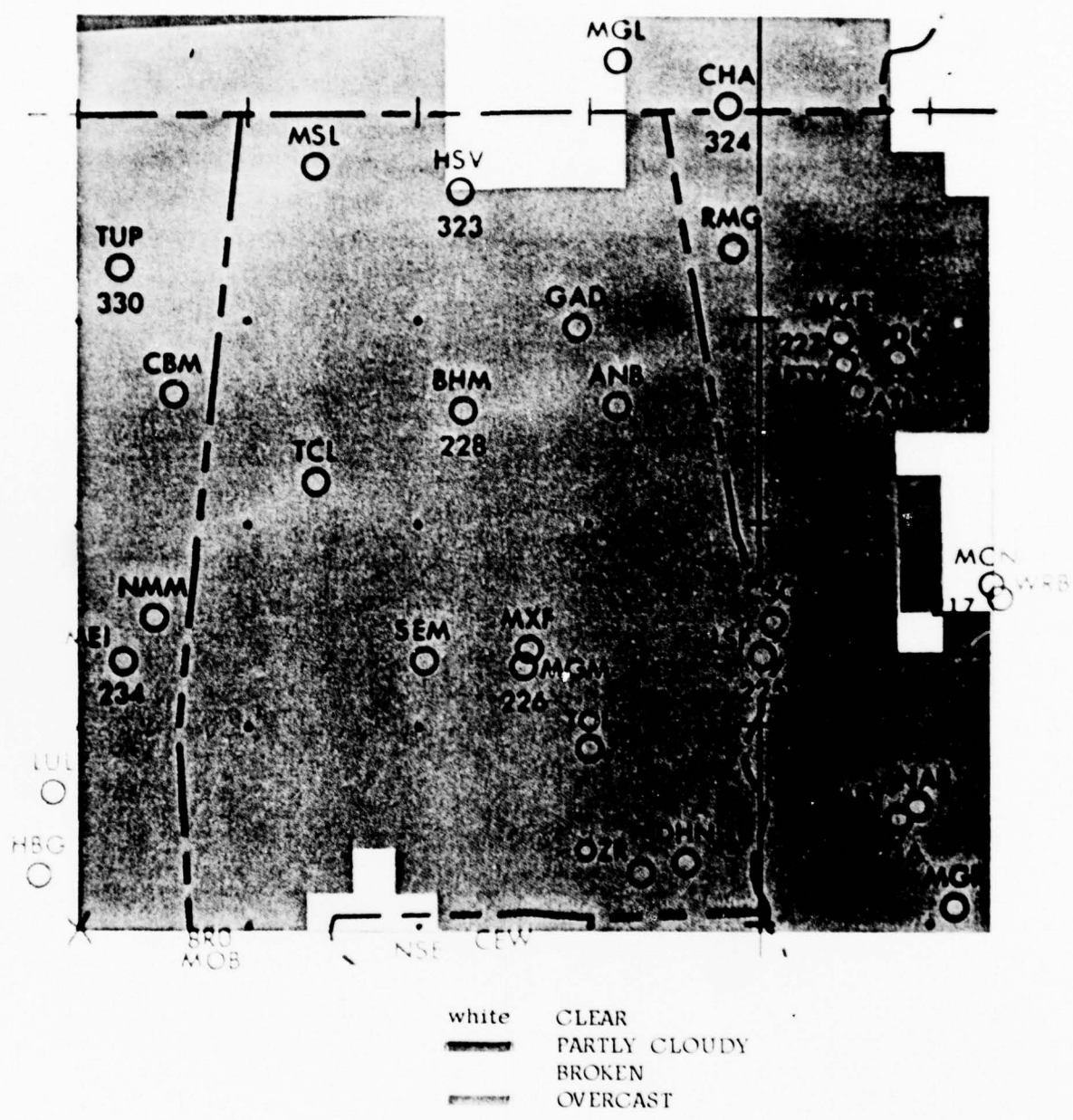


Fig. 5.7 Sky Cover 0640Z 27 Feb 1977 Computer Analysis

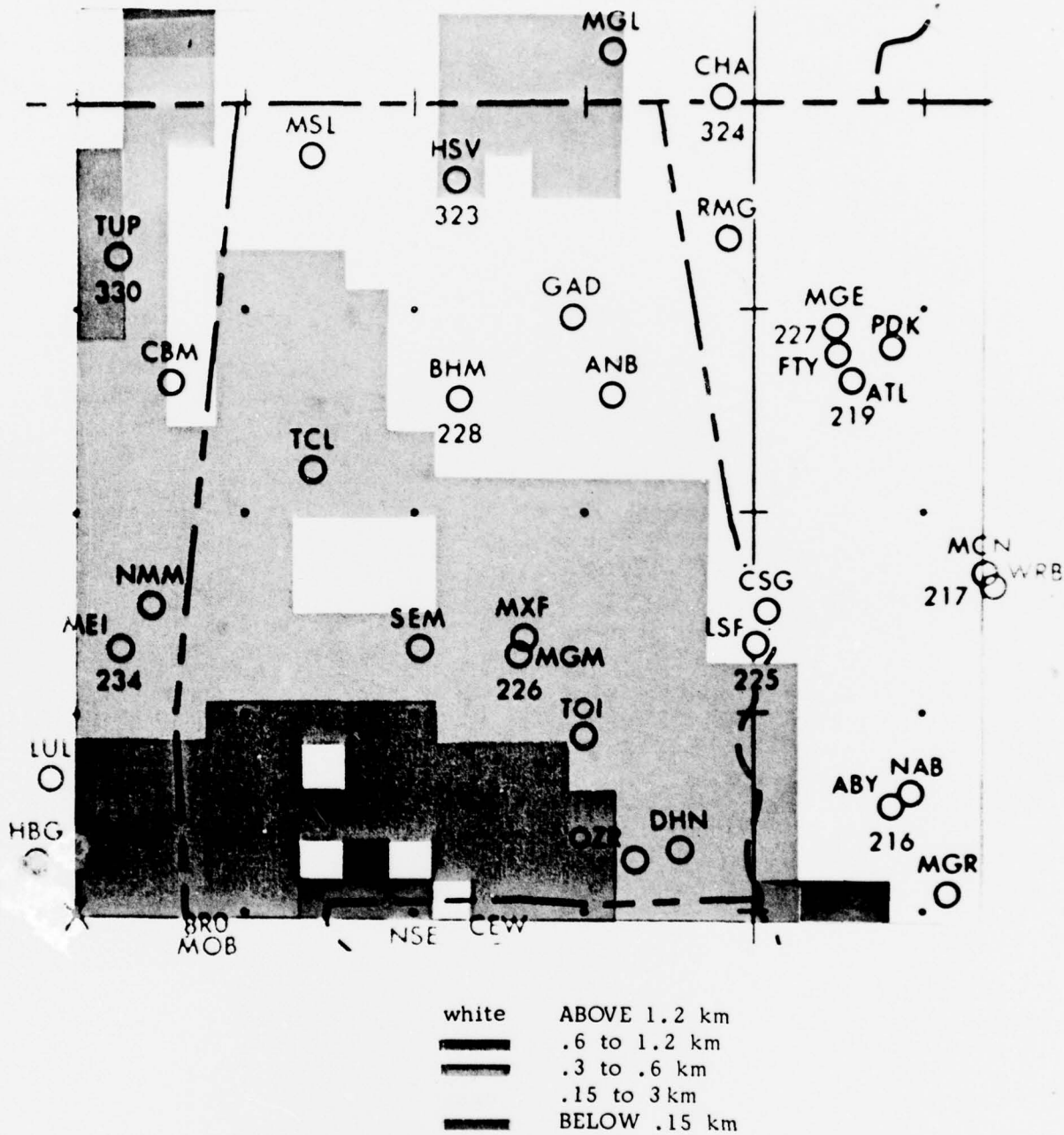


Fig. 5.8 Lowest Cloud Base 0040Z 27 Feb 1977 Computer Analysis

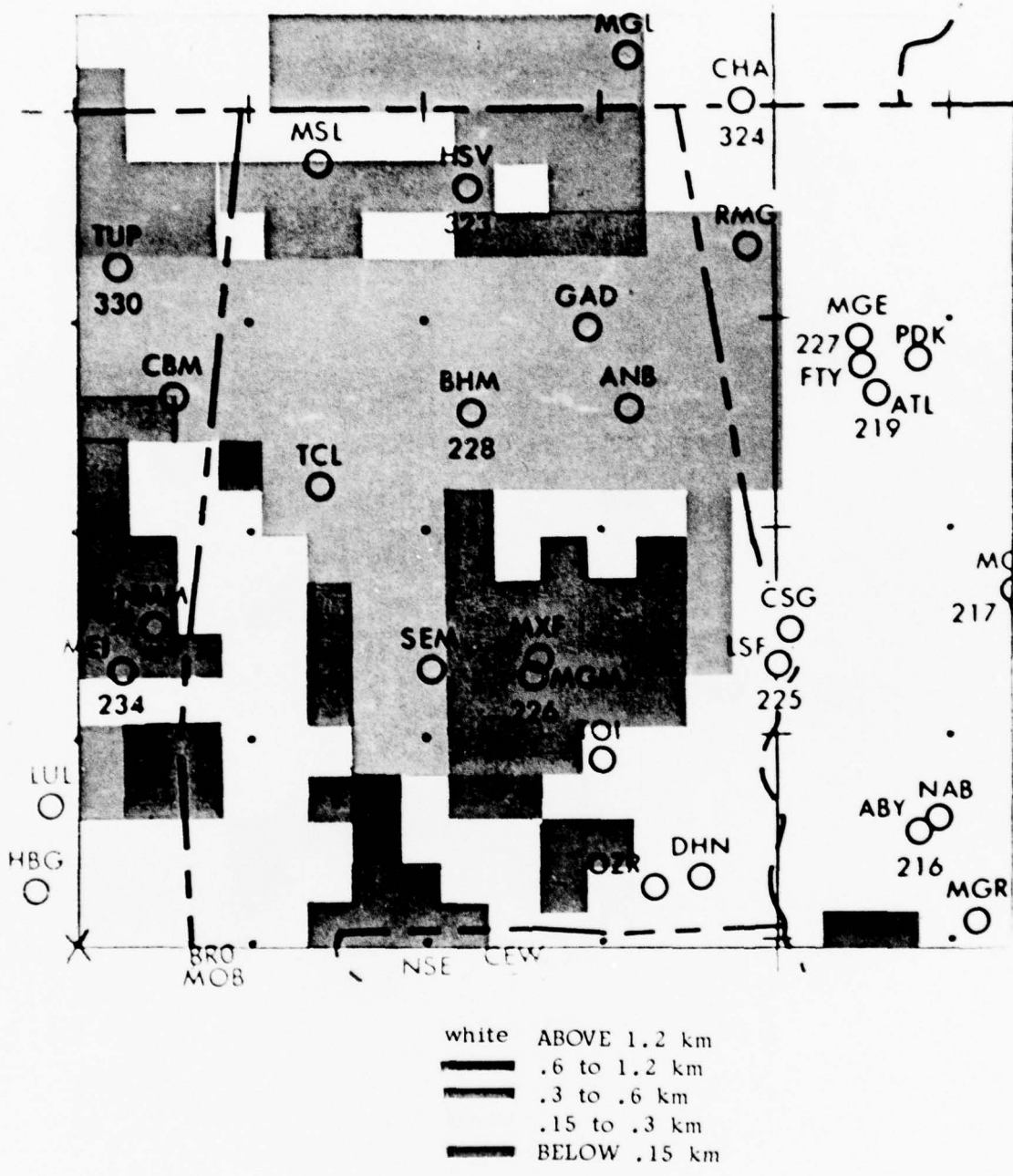


Fig. 5.9 Lowest Cloud Base 0340Z 27 Feb 1977 Computer Analysis

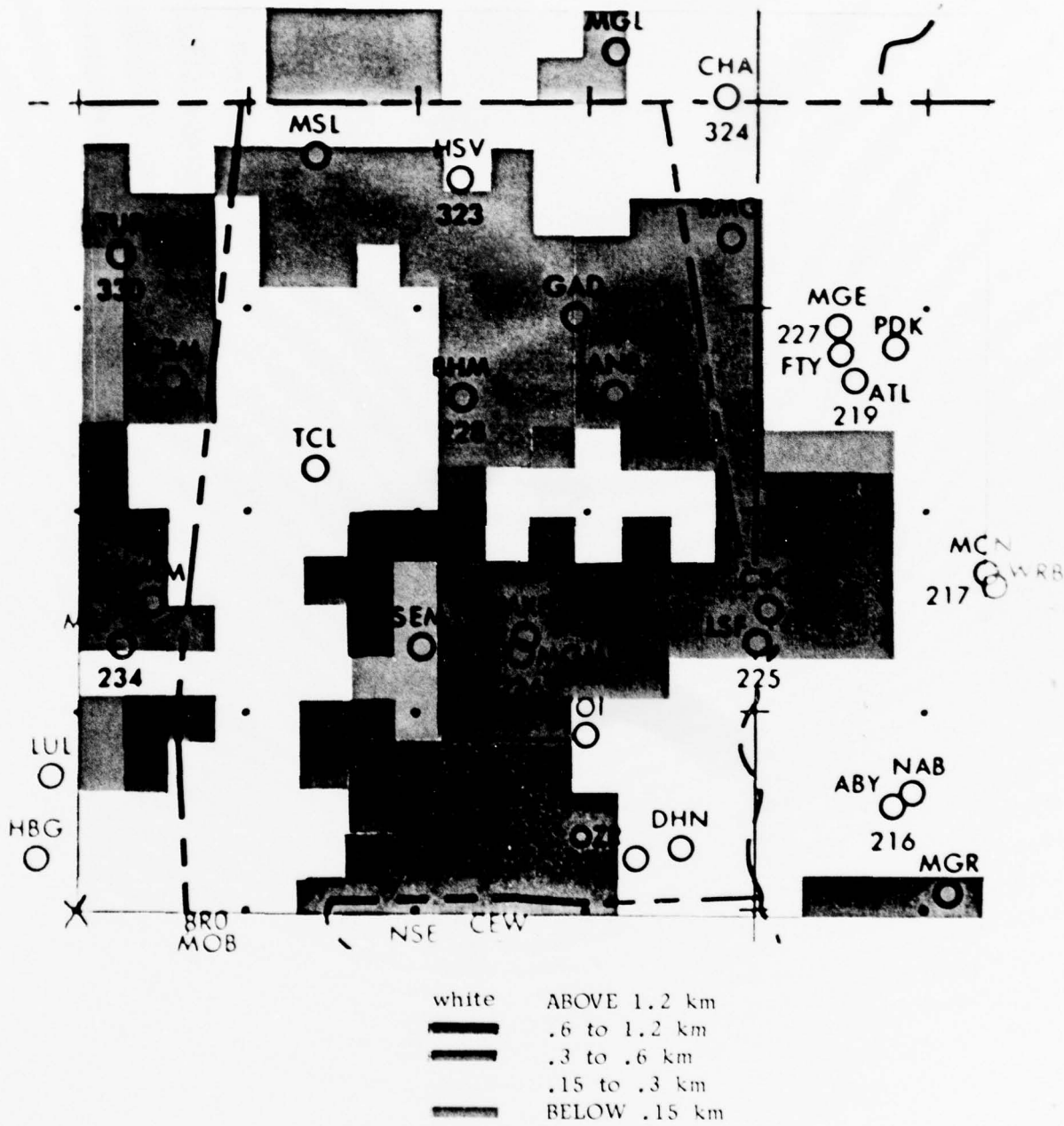


Fig. 5.10 Lowest Cloud Base 0510Z 27 Feb 1977 Computer Analysis

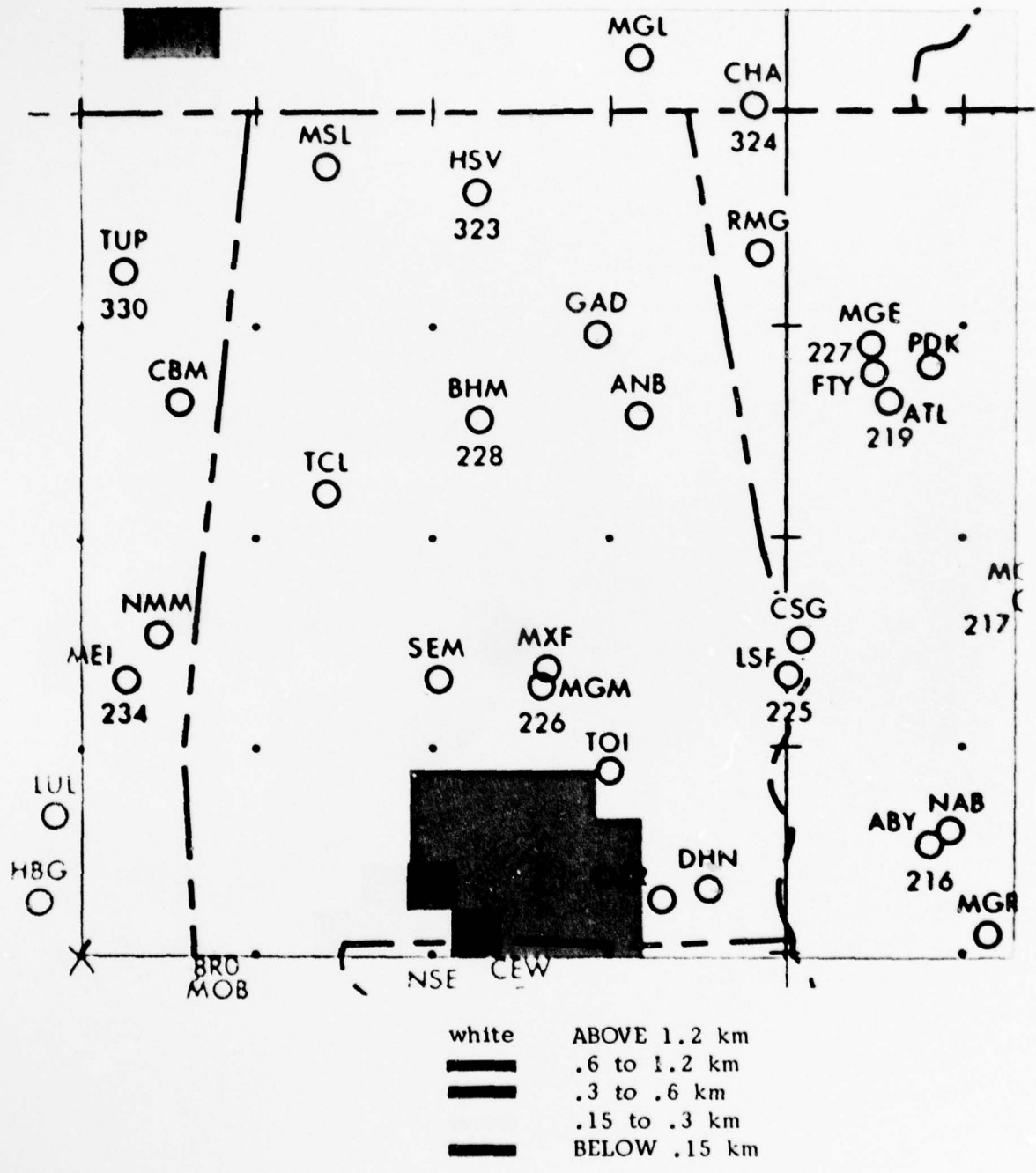


Fig. 5.12 Ceiling 0040Z 27 Feb 1977 Computer Analysis

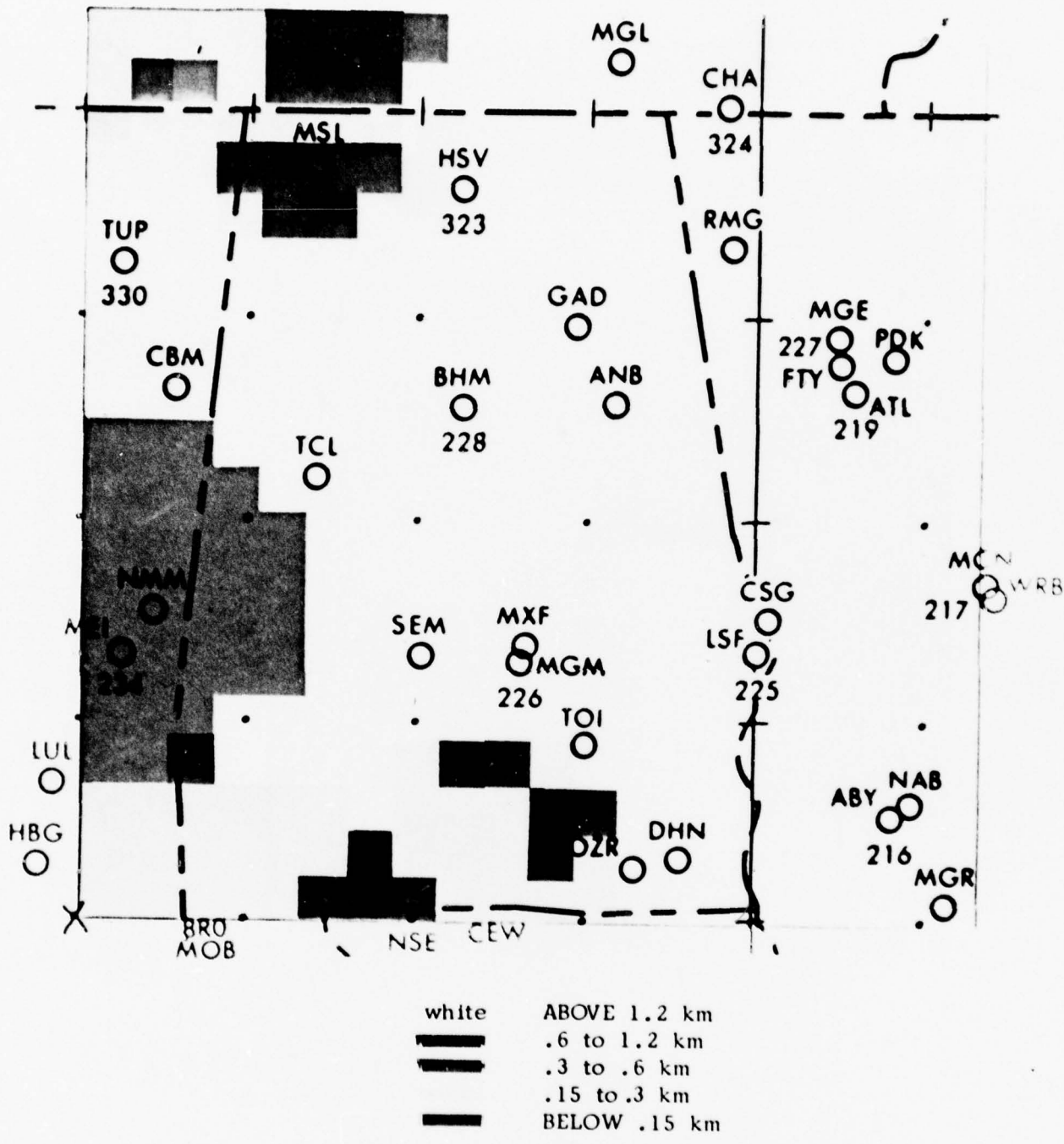


Fig. 5.13 Ceiling 0340Z 27 Feb 1977 Computer Analysis

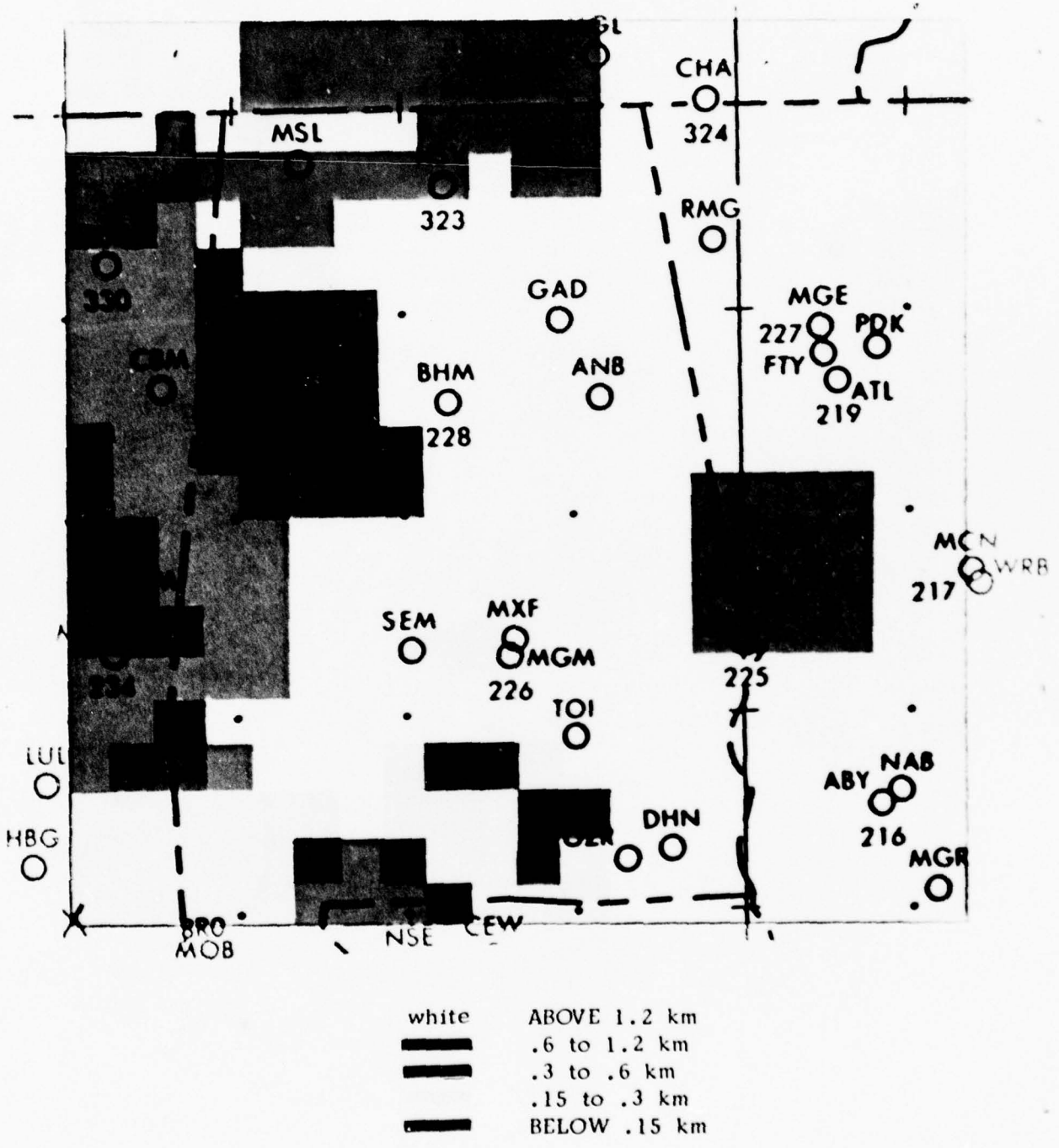


Fig. 5.14 Ceiling 0510Z 27 Feb 1977 Computer Analysis

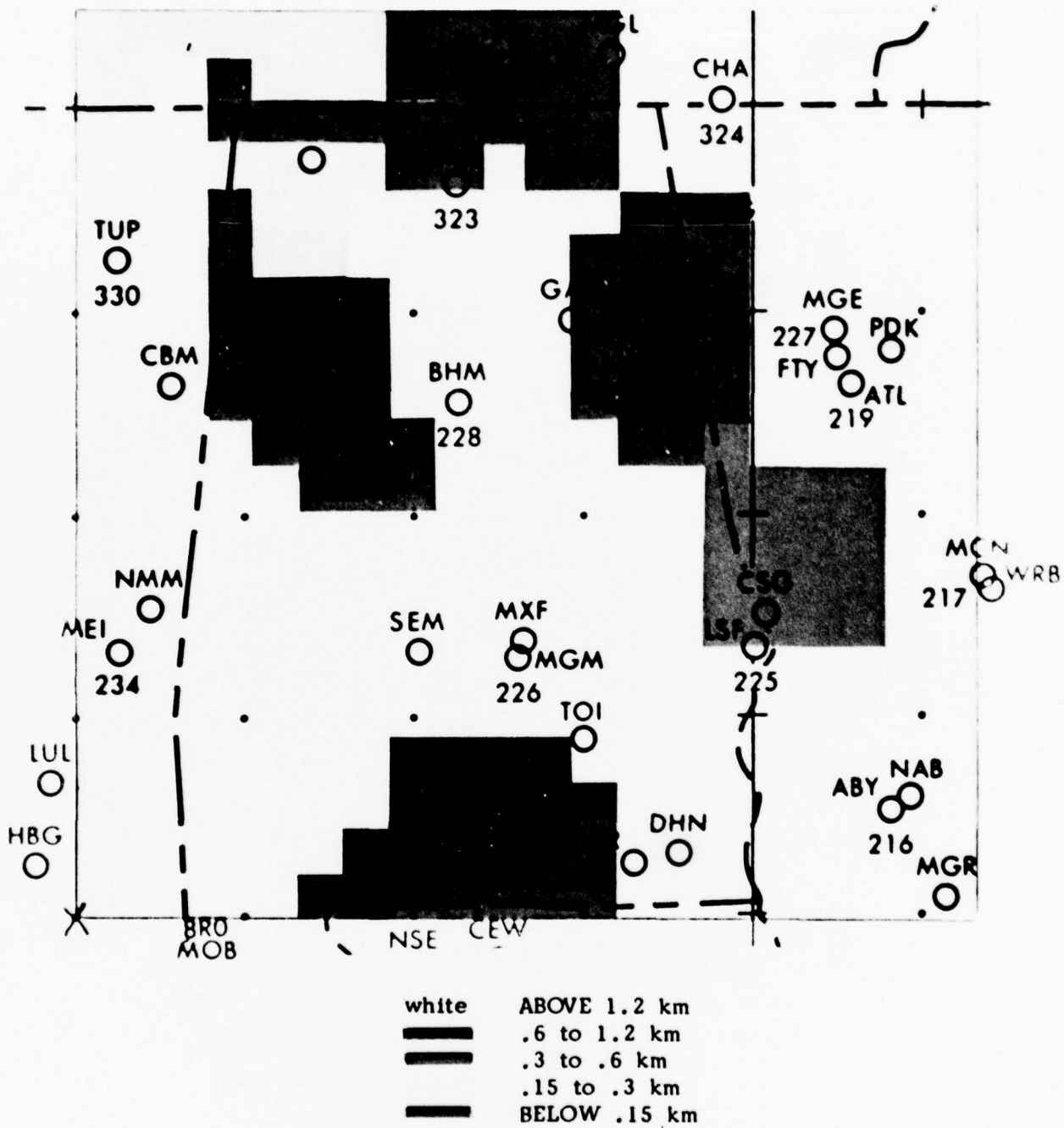


Fig. 5.15 Ceiling 0640Z 27 Feb 1977 Computer Analysis

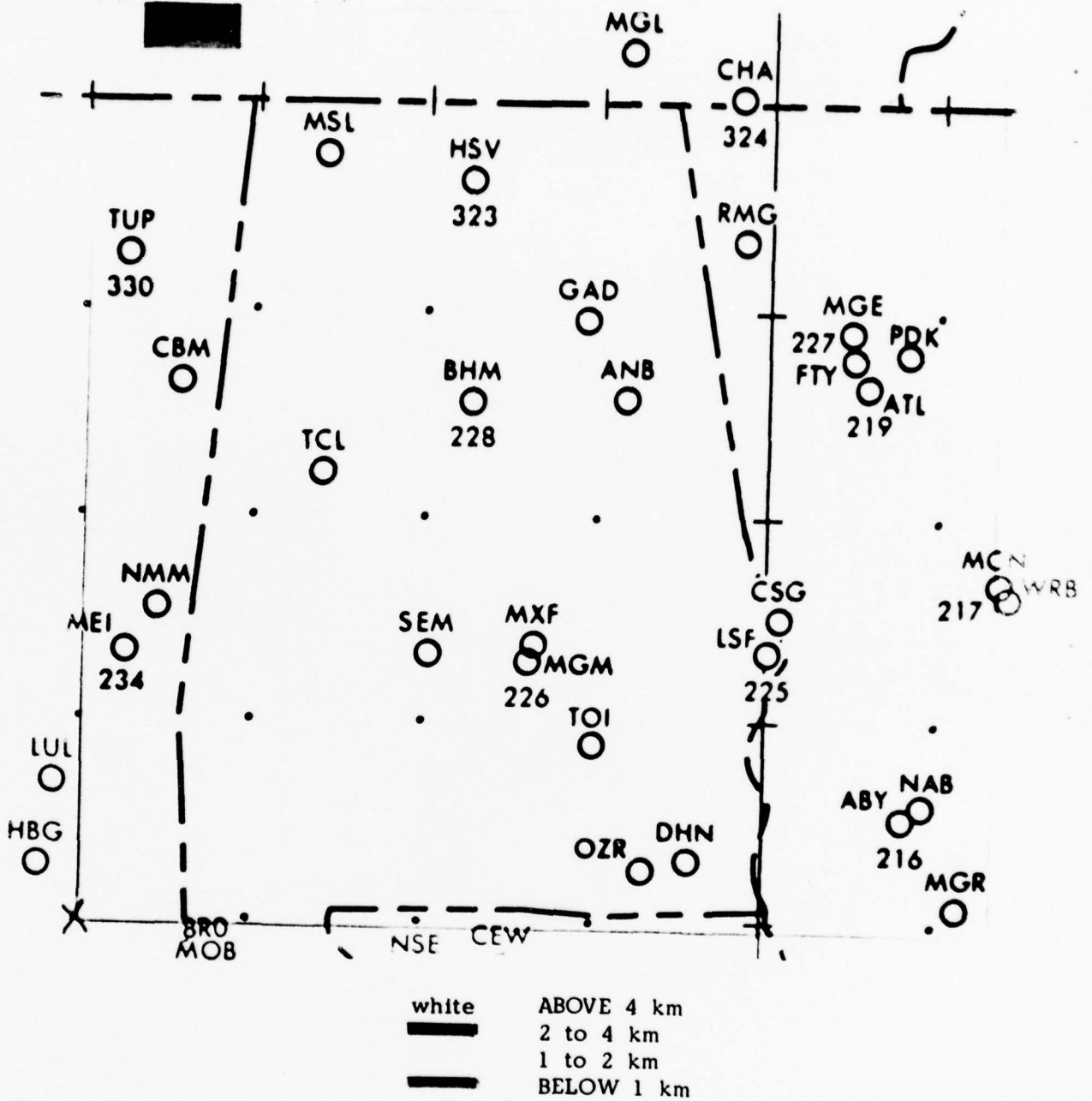


Fig. 5.16 Visibility 0040Z 27 Feb 1977 Computer Analysis

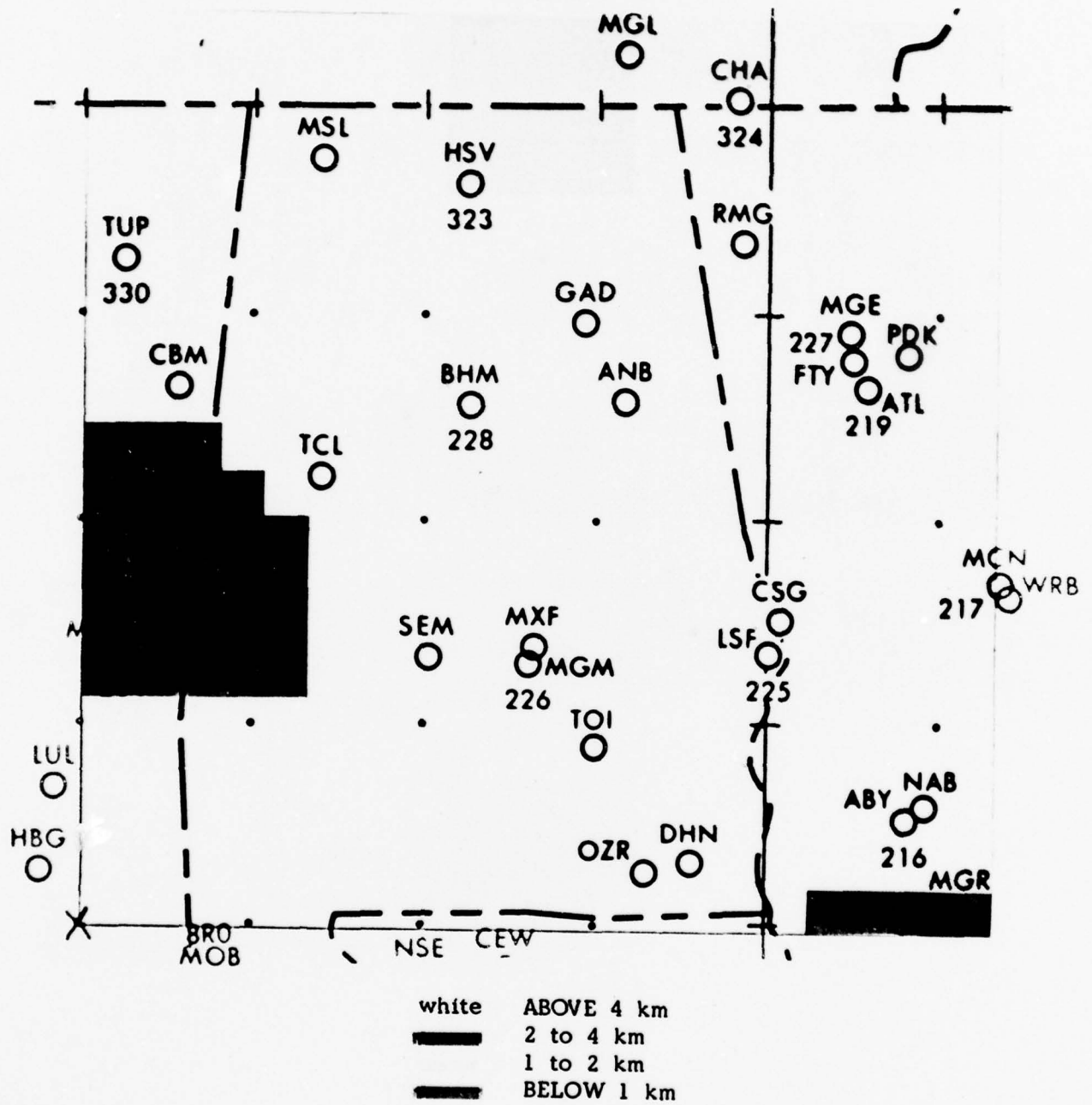


Fig. 5.17 Visibility 0340Z 27 Feb 1977 Computer Analysis

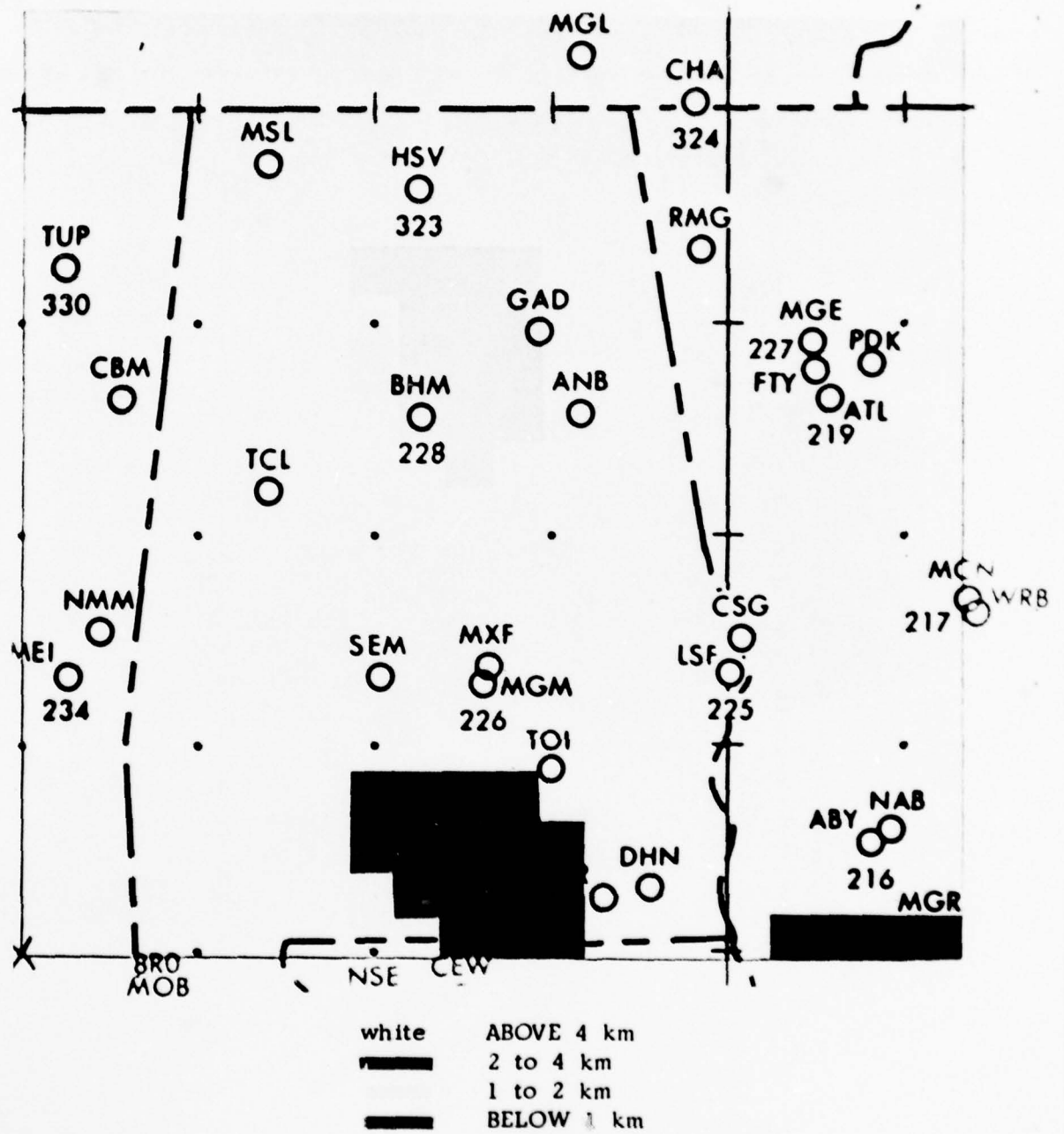


Fig. 5.18 Visibility 0510Z 27 Feb 1977 Computer Analysis

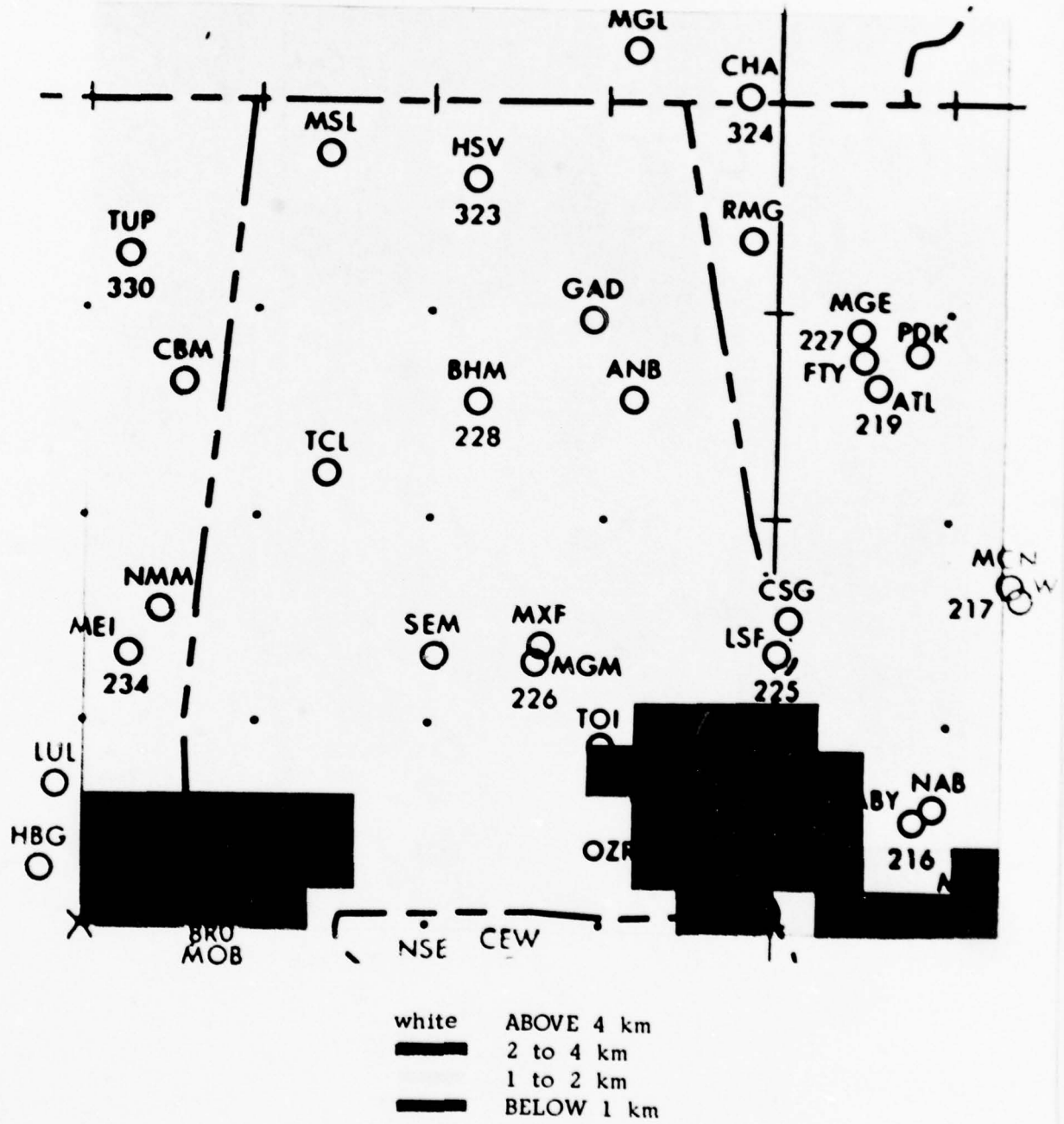


Fig. 5.19 Visibility 0640Z 27 Feb 1977 Computer Analysis

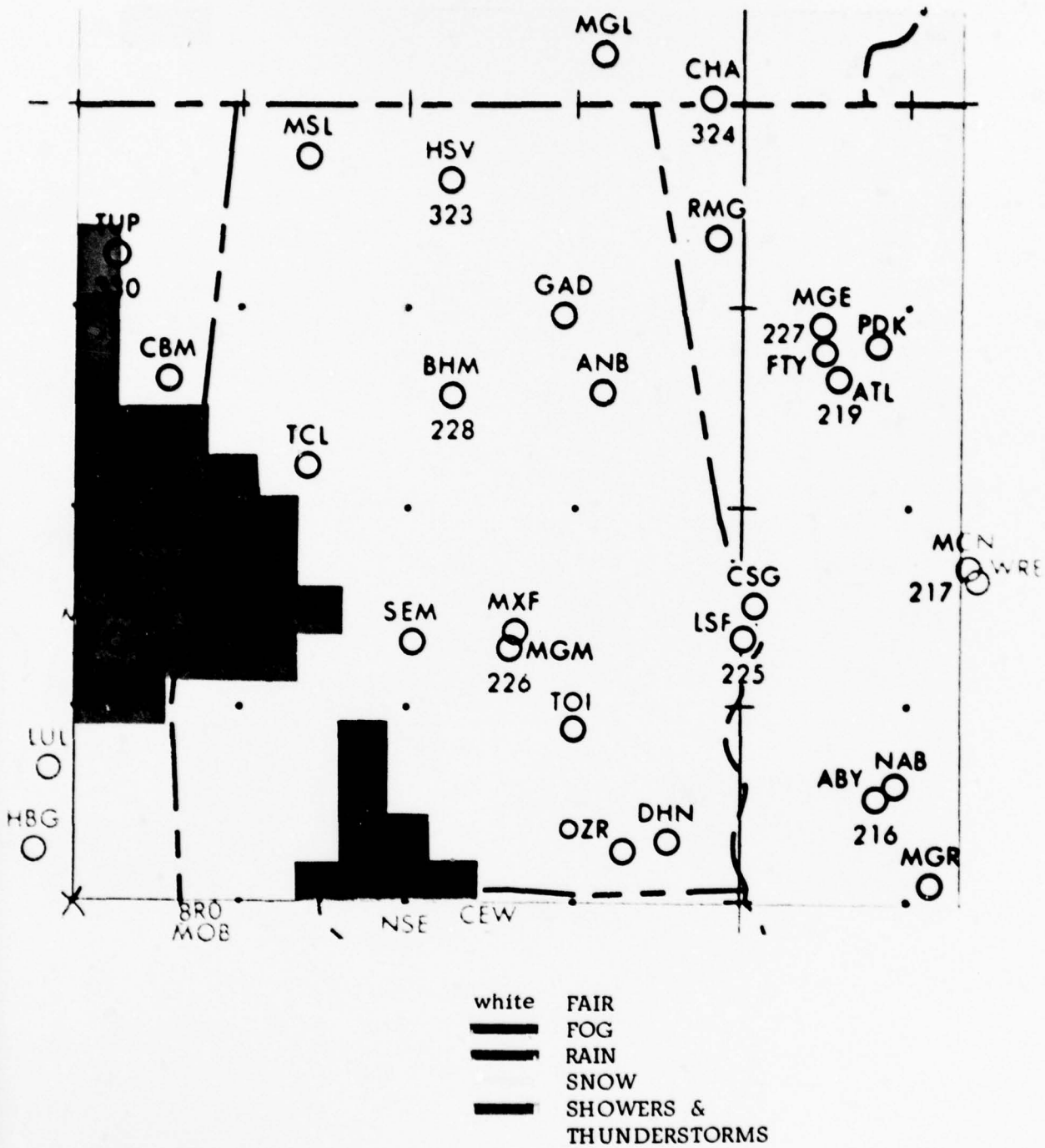


Fig. 5.20 Present Weather 0040Z 27 Feb 1977 Computer Analysis

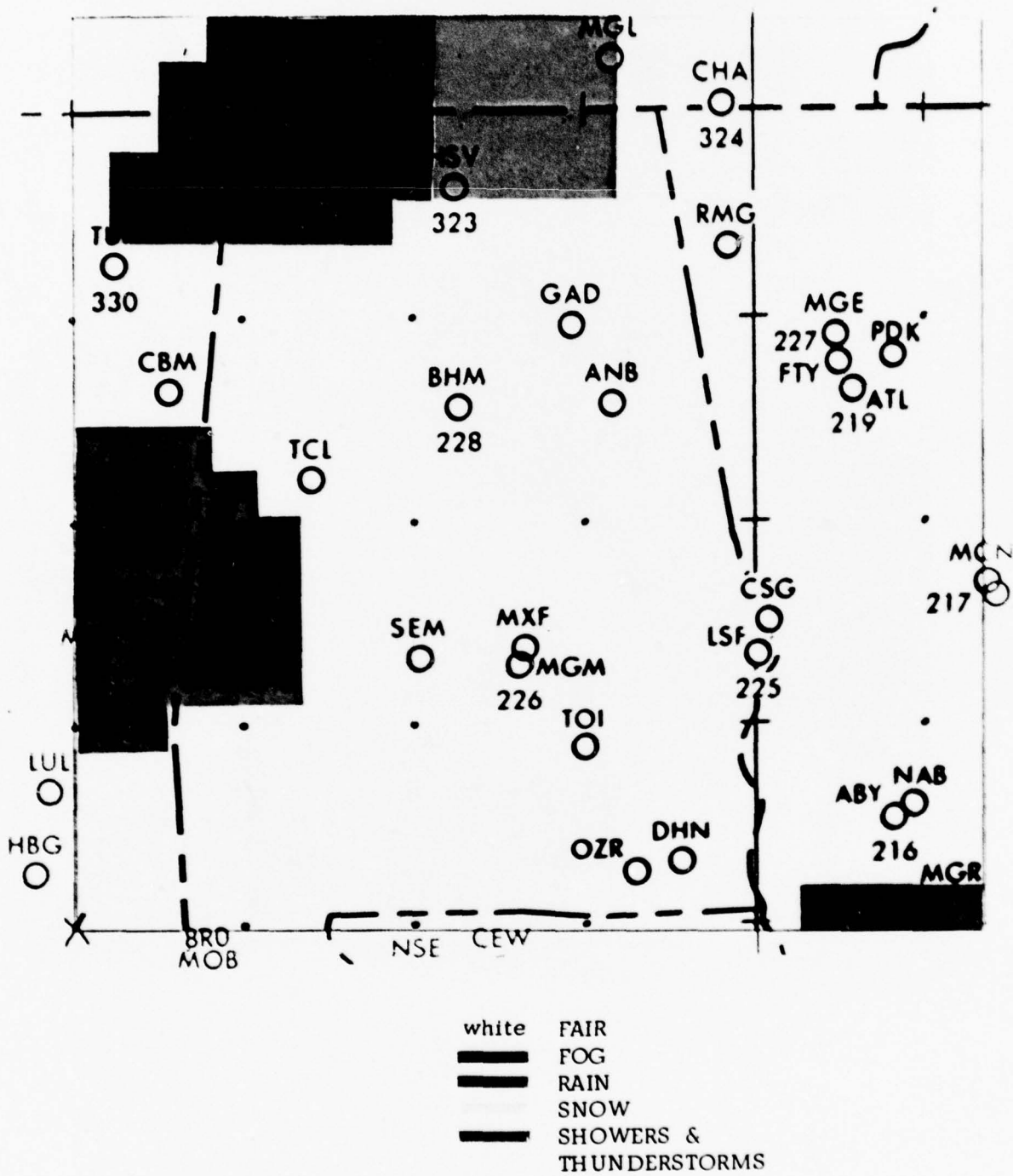


Fig. 5.21 Present Weather 0340Z 27 Feb 1977 Computer Analysis

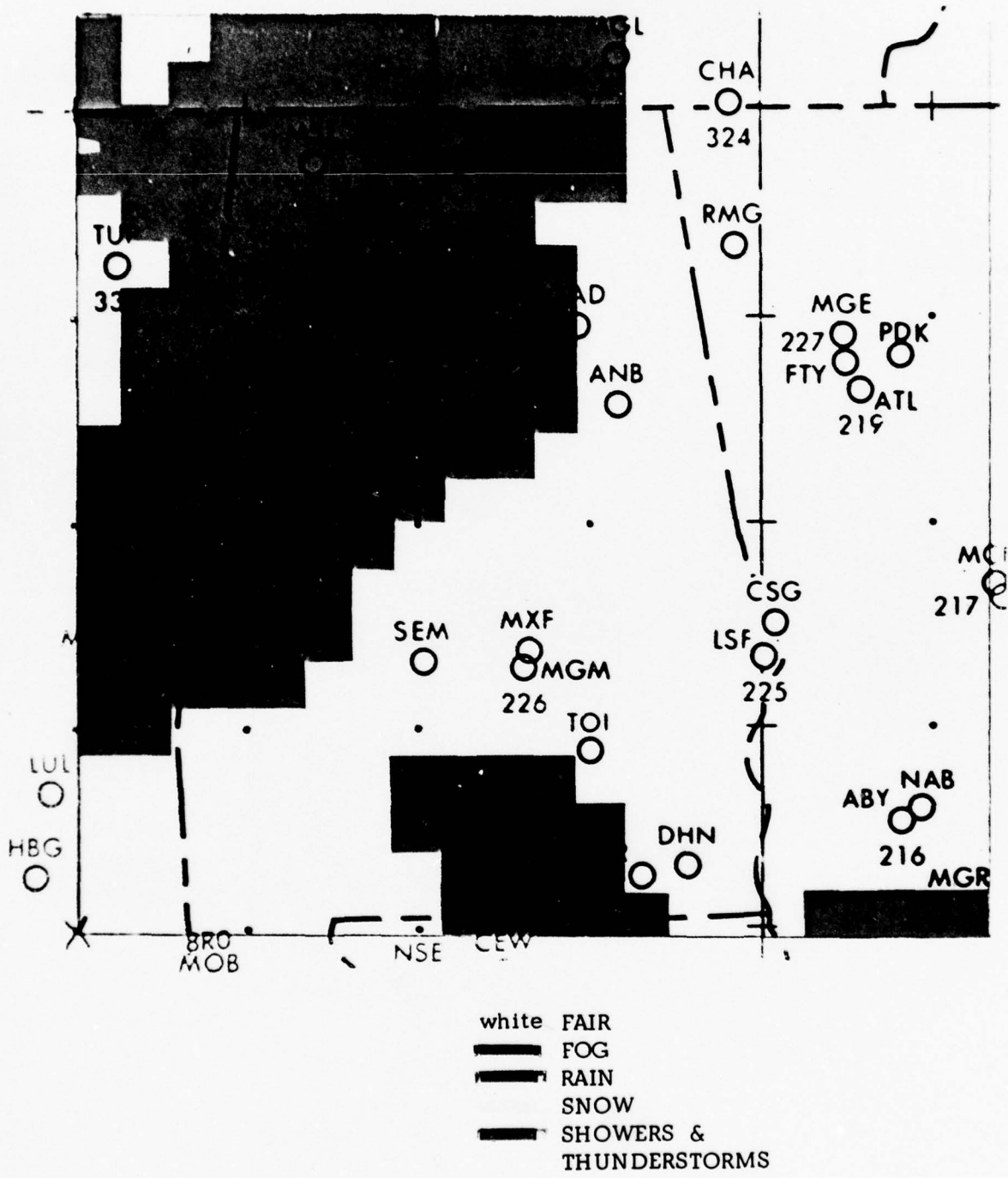


Fig. 5.22 Present Weather 0510Z 27 Feb 1977 Computer Analysis

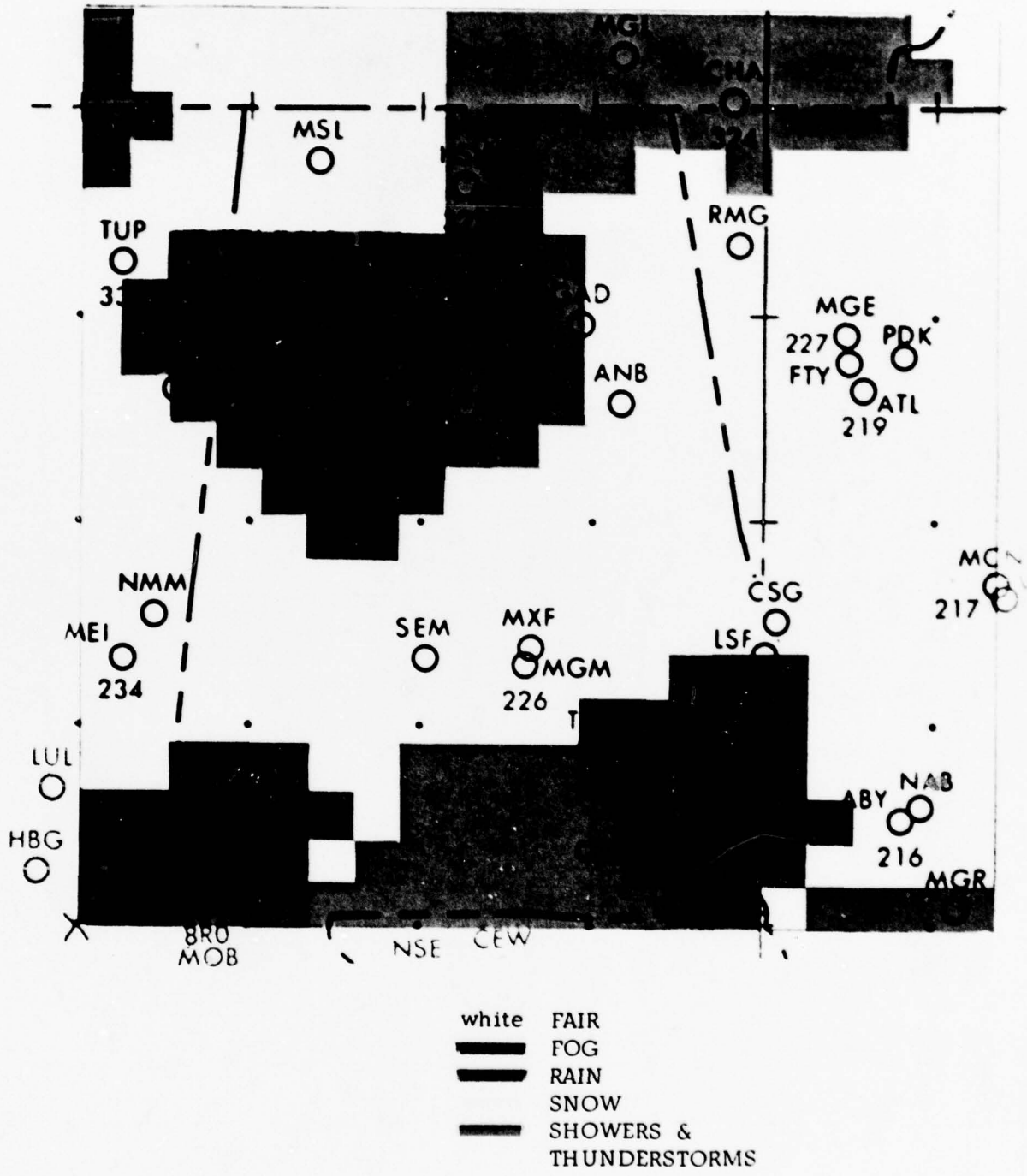


Fig. 5.23 Present Weather 0640Z 27 Feb 1977 Computer Analysis

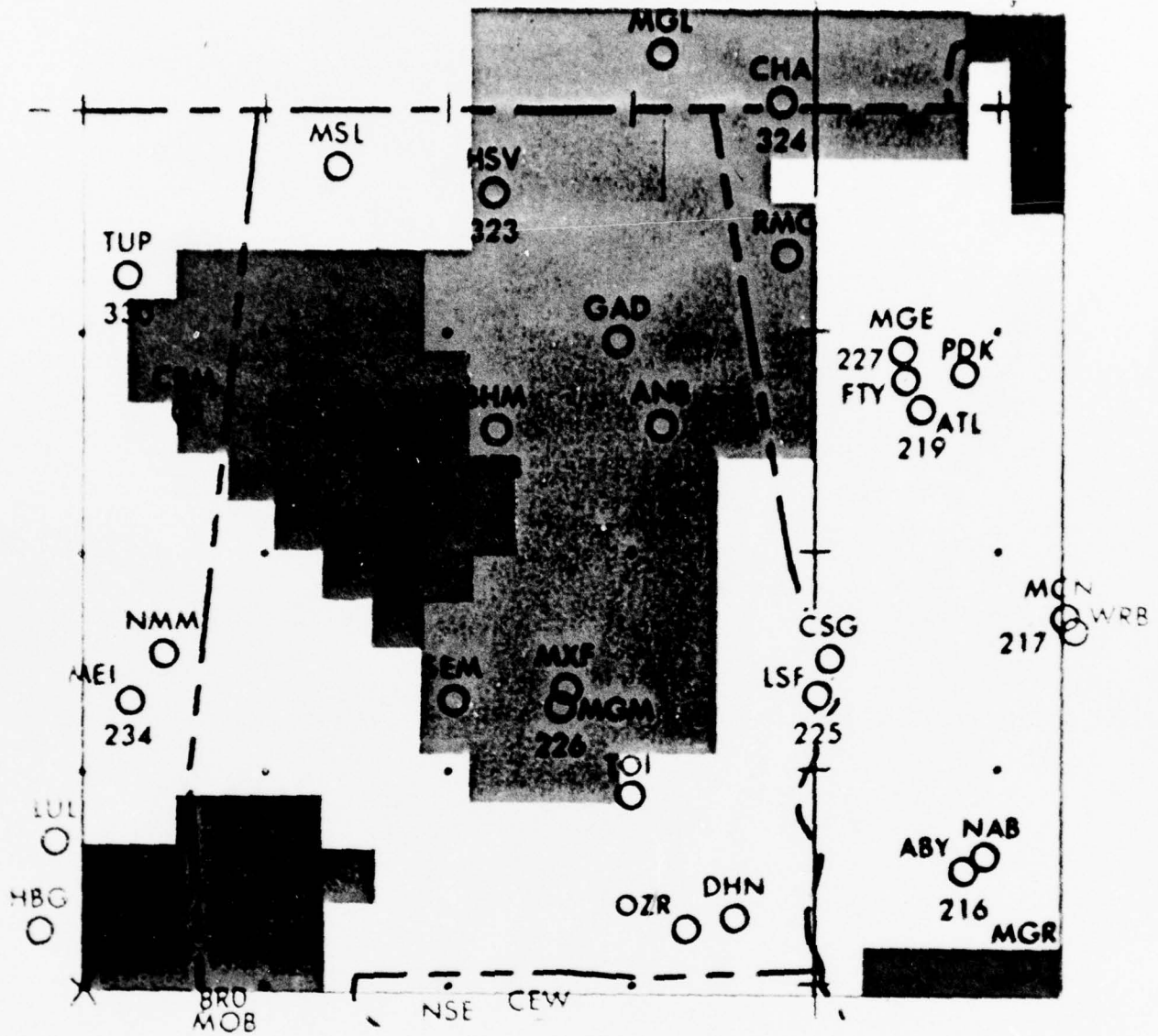


Fig. 5.24 Present Weather 0720Z 27 Feb 1977 Computer Analysis

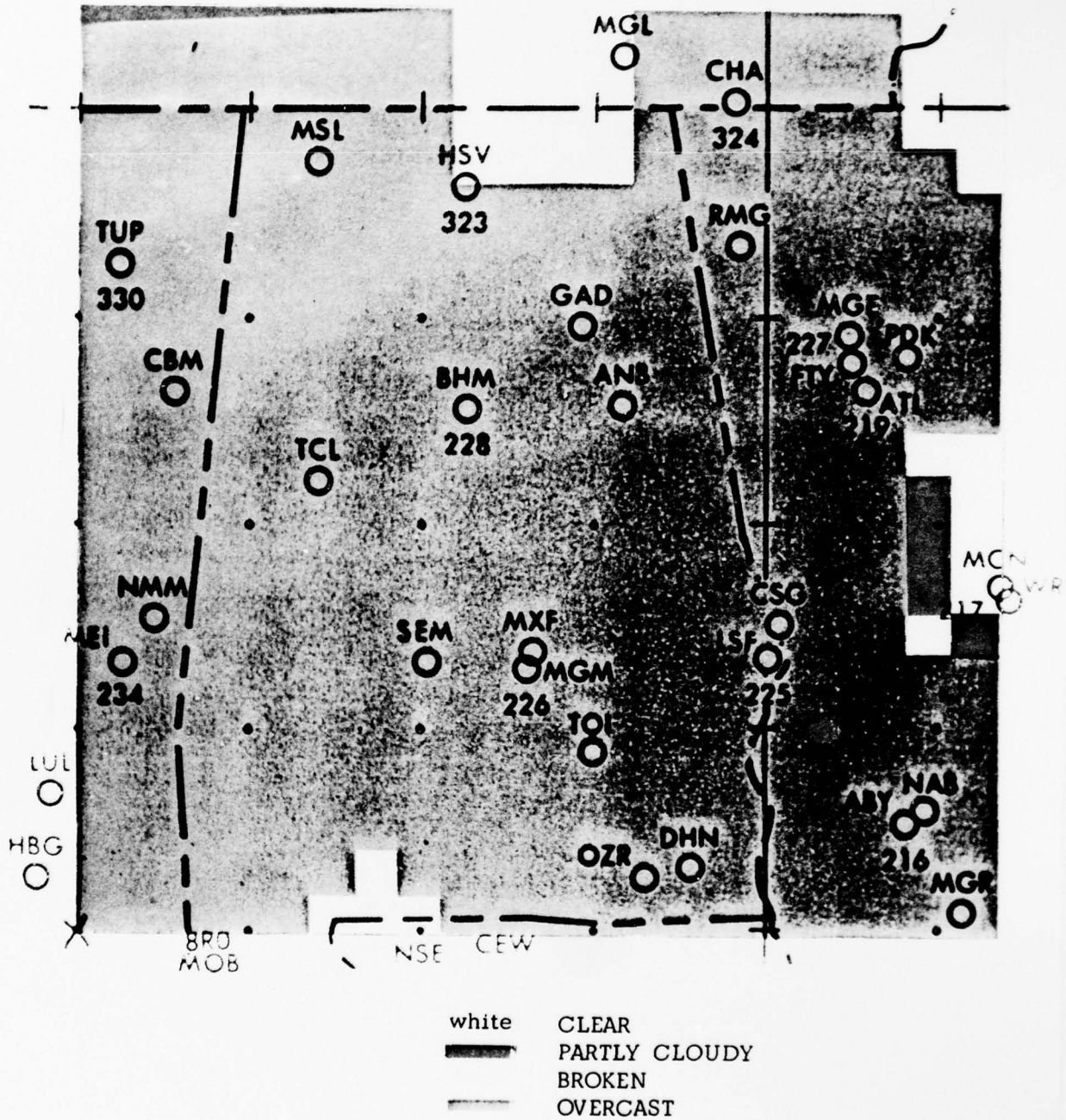


Fig. 5.25 Sky Cover 0640Z 27 Feb 1977 Computer Analysis

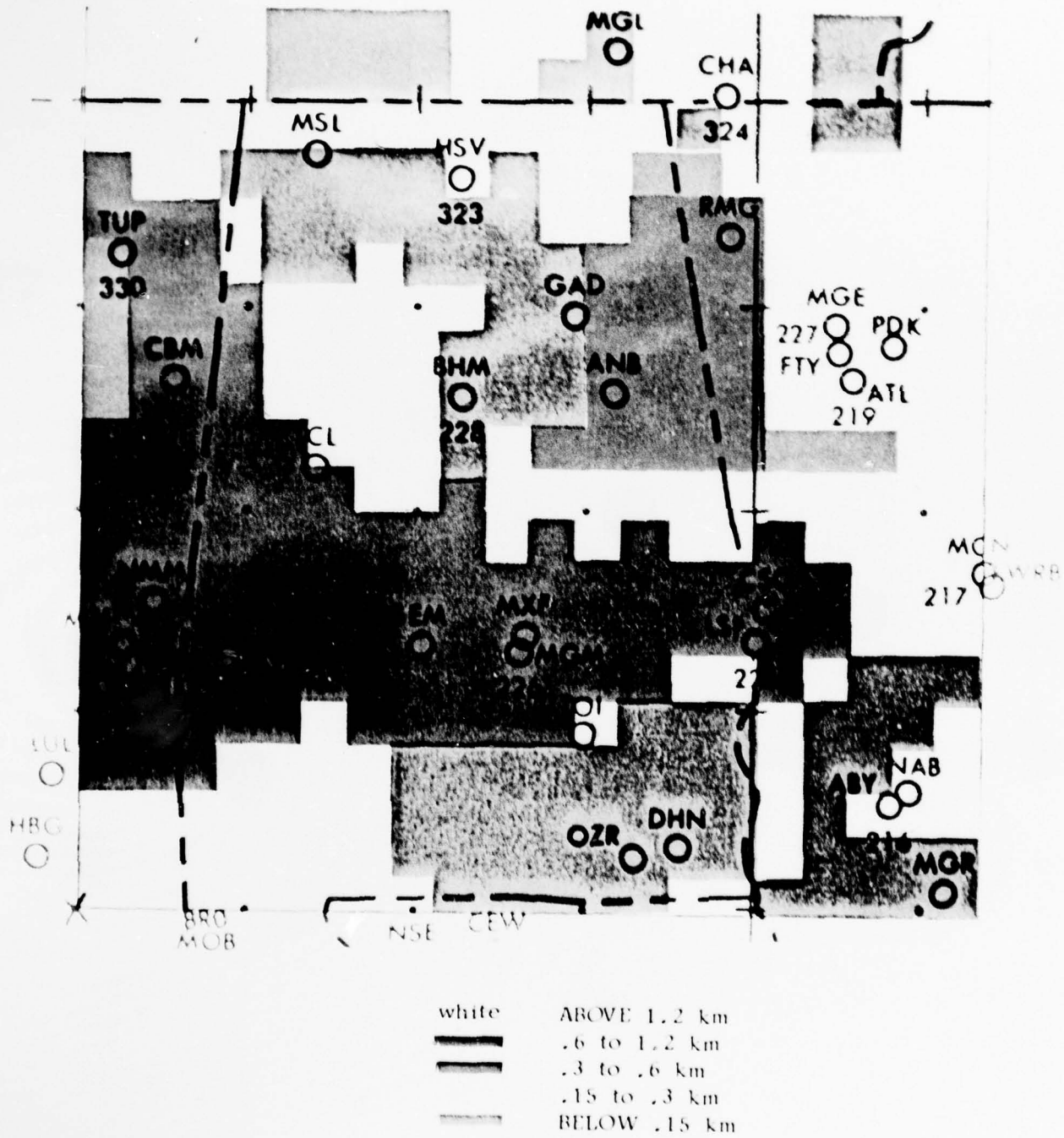


Fig. 5.26 Lowest Cloud Base 06:40Z 27 Feb 1977 Computer Analysis

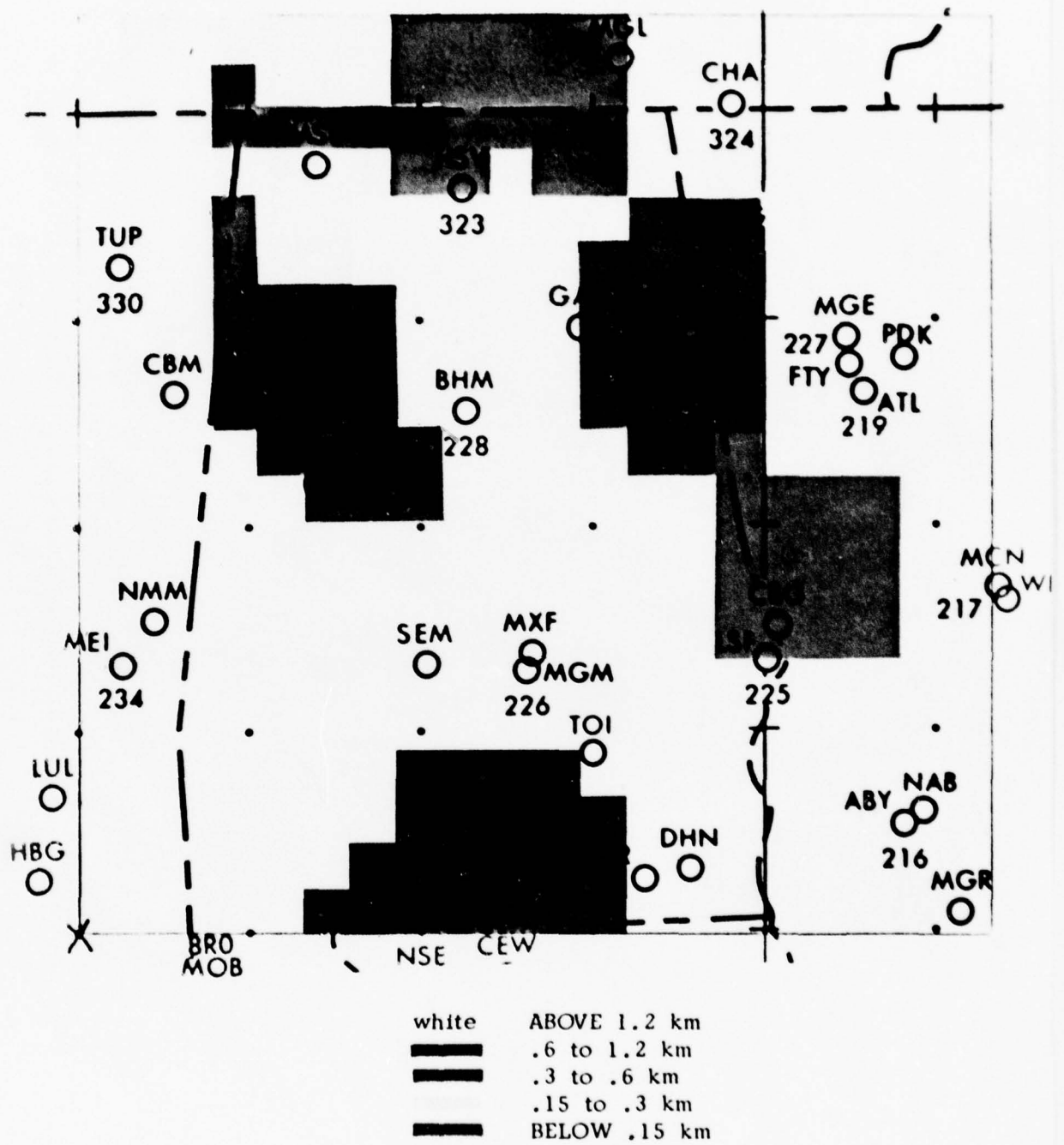


Fig. 5.27 Ceiling 0640Z 27 Feb 1977 Computer Analysis

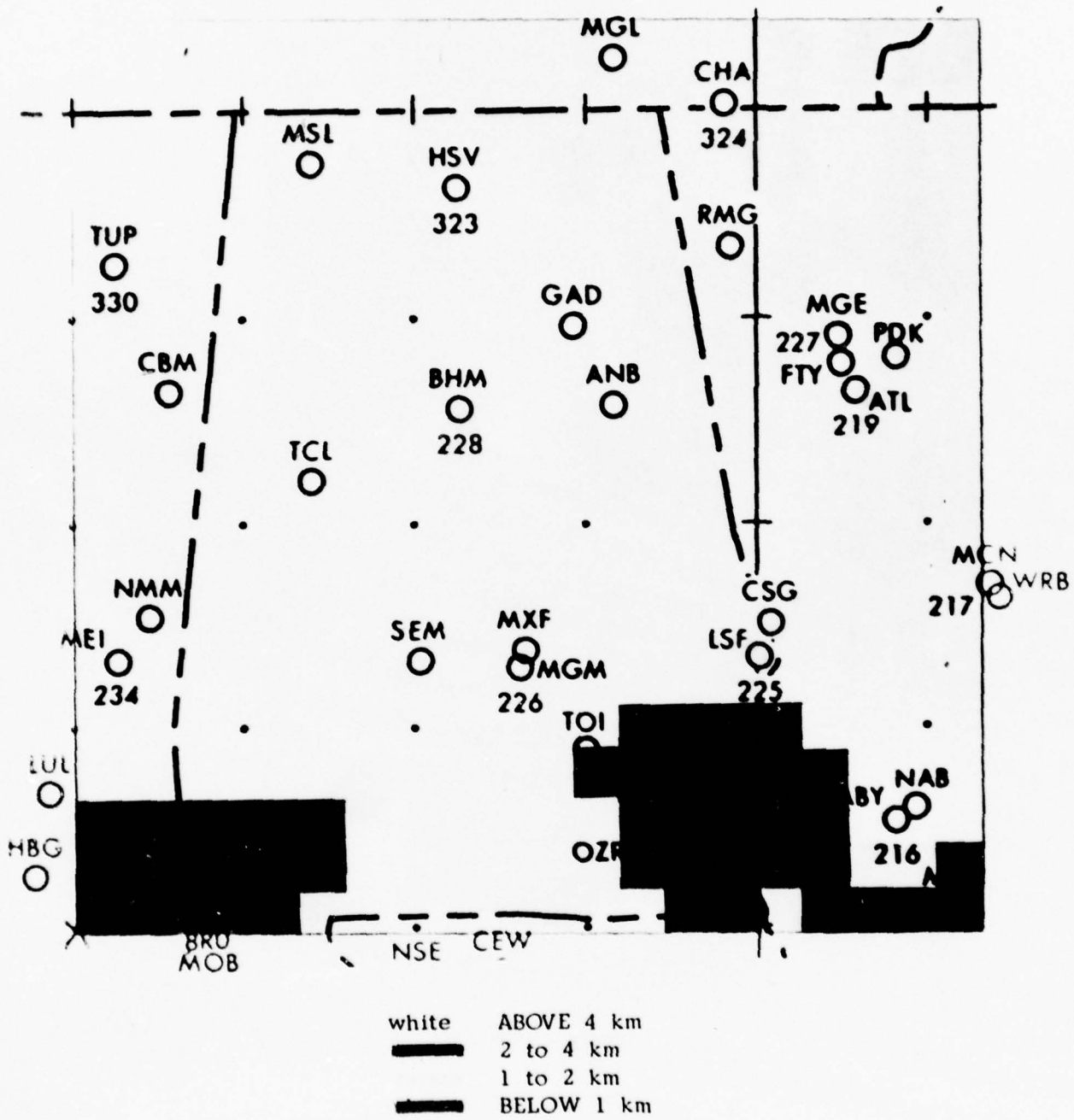


Fig. 5.28 Visibility 0640Z 27 Feb 1977 Computer Analysis

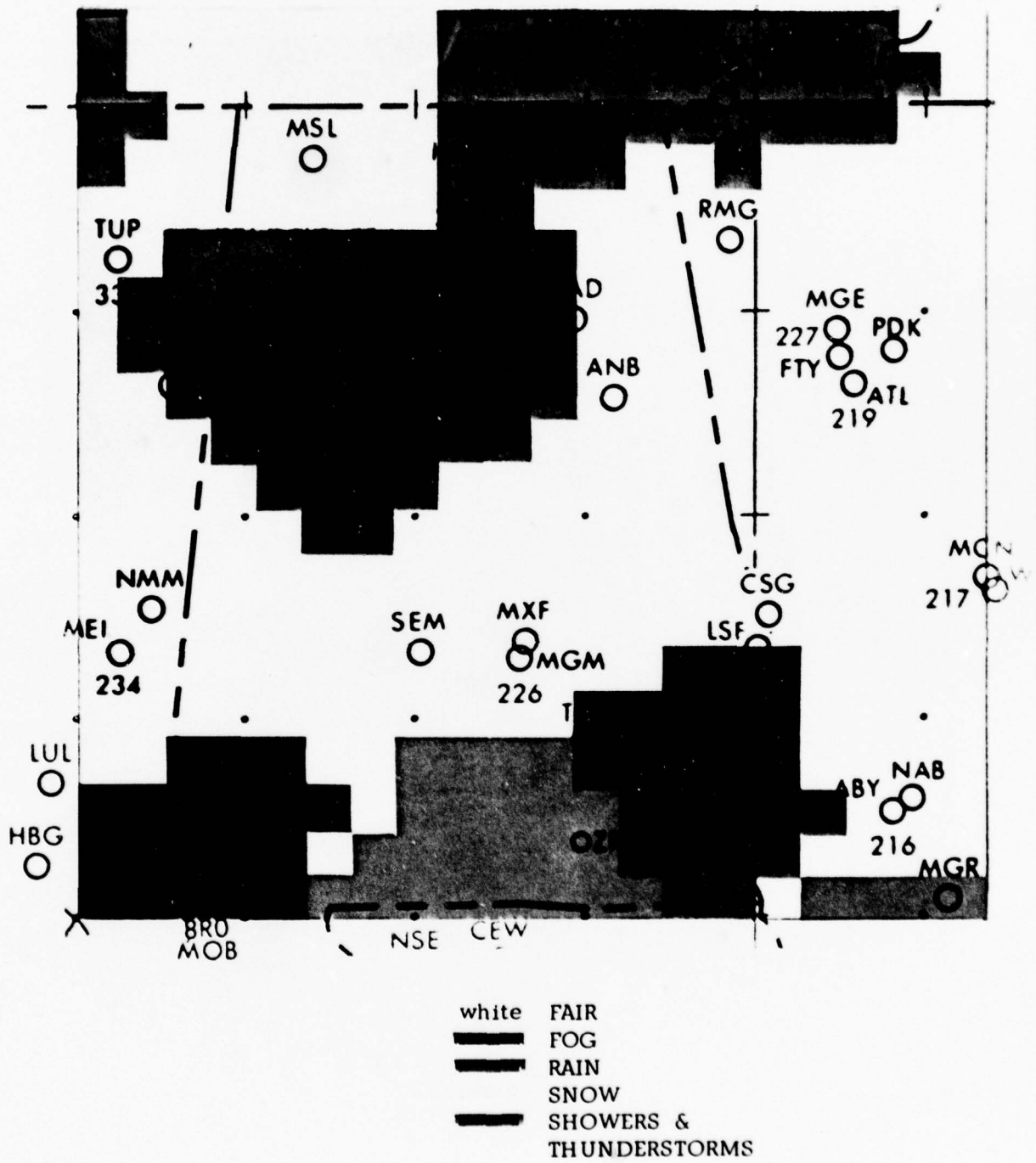


Fig. 5.29 Present Weather 0640Z 27 Feb 1977 Computer Analysis

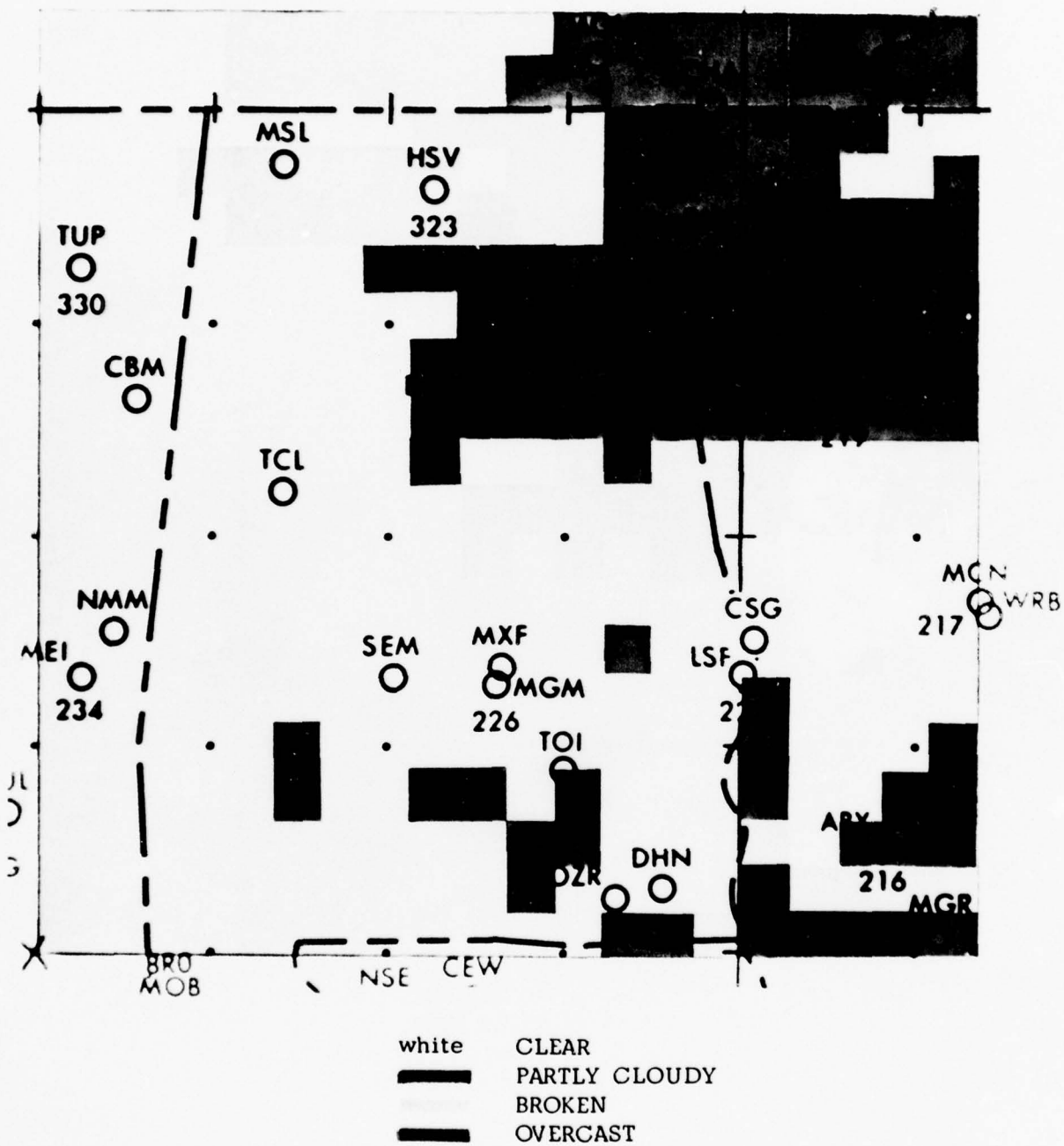


Fig. 5.30 Cloud Cover, Surface to 45 m AGL Layer, 0820Z 27 Feb 1977
Computer Analysis

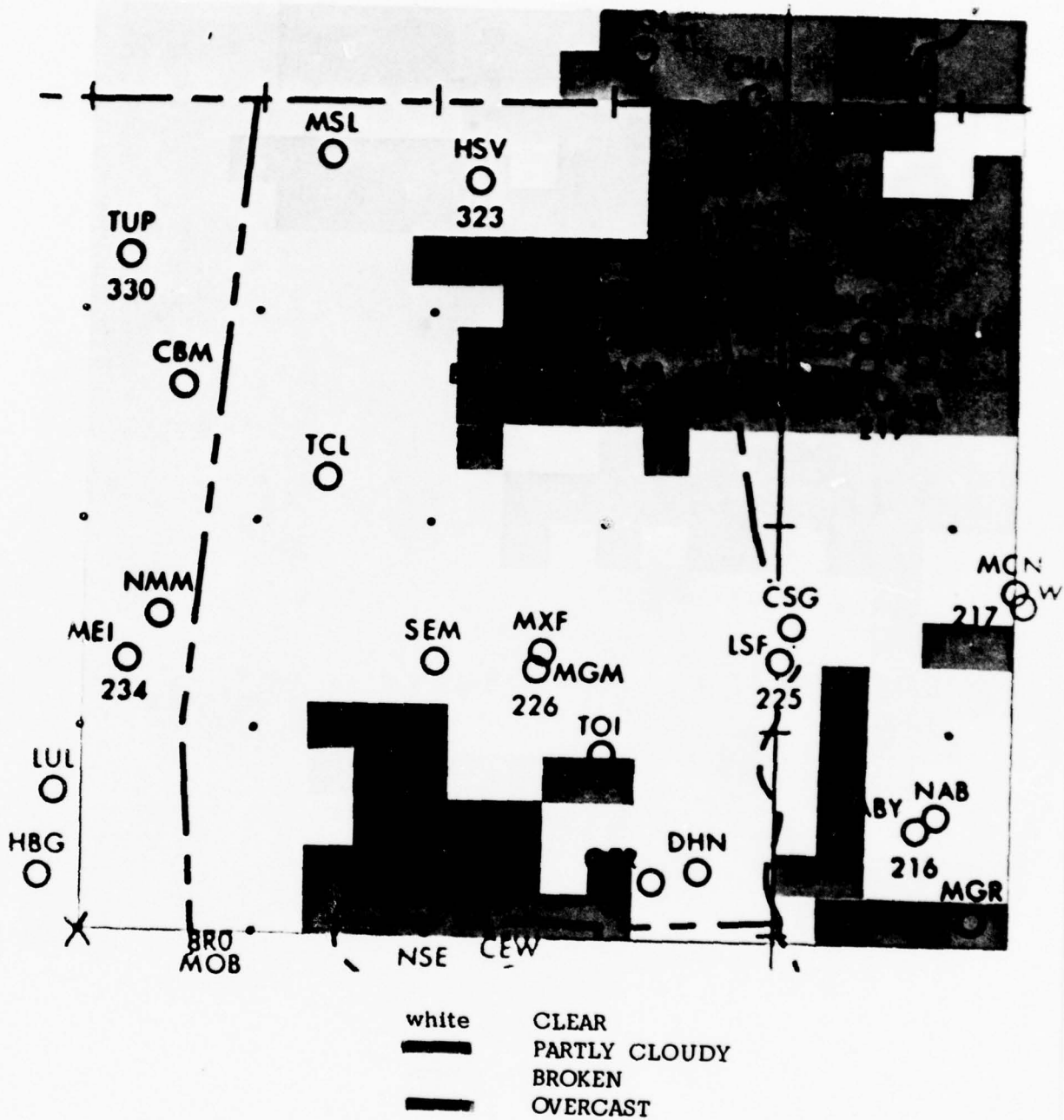


Fig. 5.31 Cloud Cover, 45 to 91 m AGL Layer, 0820Z 27 Feb 1977
Computer Analysis

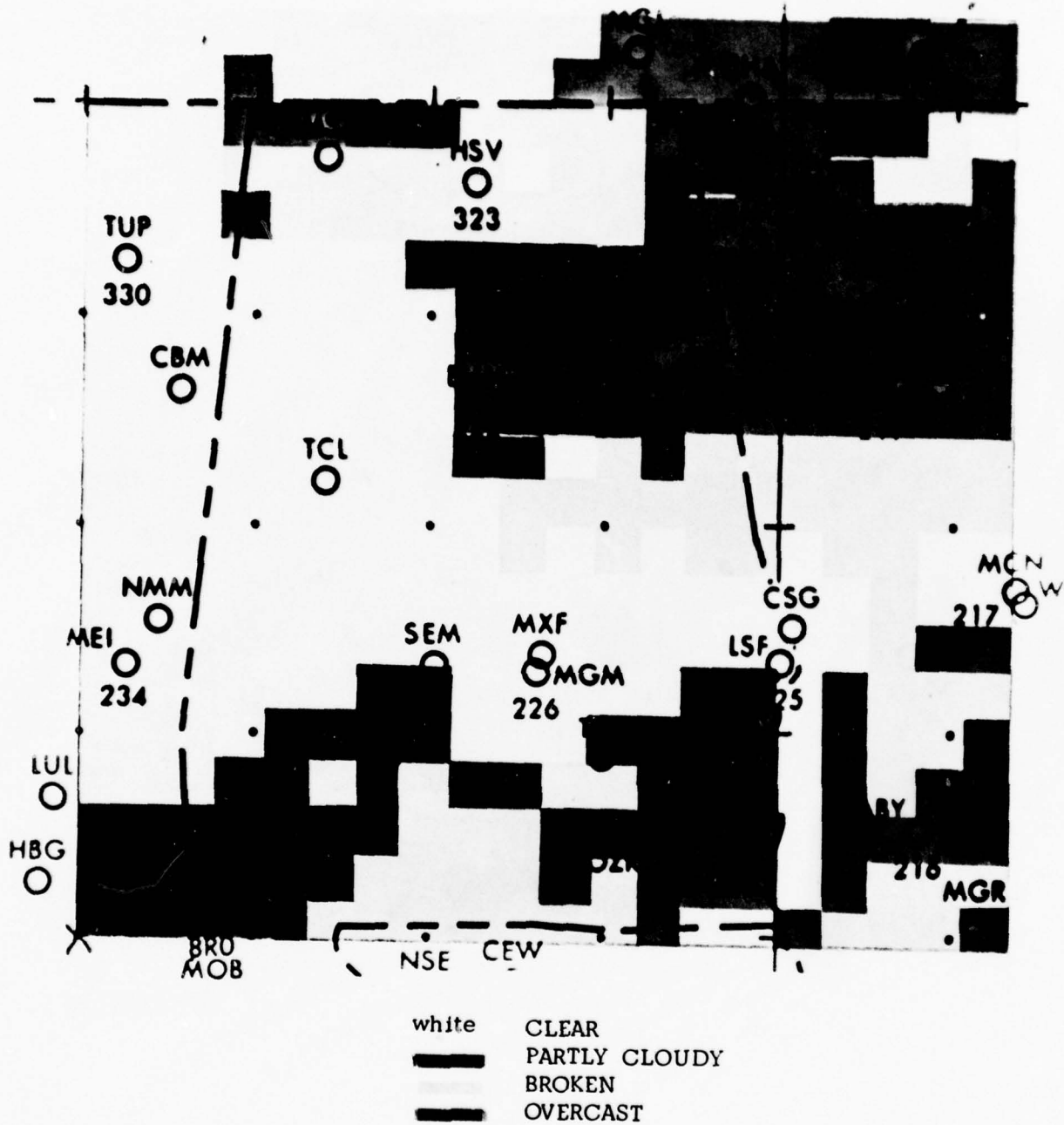


Fig. 5.32 Cloud Cover, 91 to 183 m AGL Layer, 0820Z 27 Feb 1977
Computer Analysis

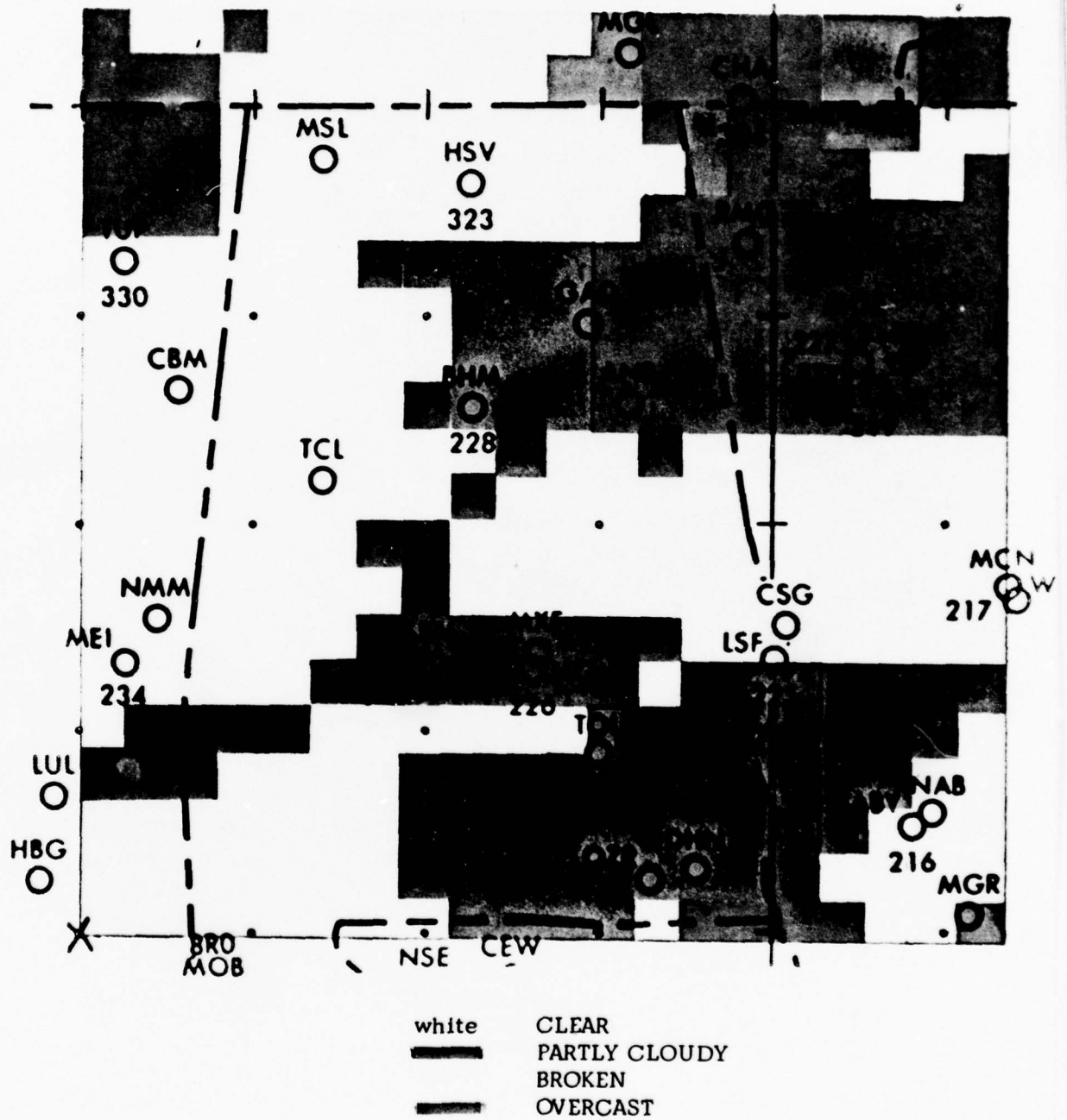


Fig. 5.33 Cloud Cover, 183 to 305 m AGL Layer, 0820Z 27 Feb 1977
Computer Analysis

6 RESULTANT MODIFICATIONS OF CFAS-CFAR PROGRAM ELEMENTS

6.1 SUMMARY

In the course of this effort, the CFAS-CFAR was used extensively on a large data base exhibiting a wide range of cloud formations, surface visibilities and weather phenomenon. As a result of this activity, the need for modifications to several CFAS-CFAR program elements was identified. These modifications were prompted by one or more of the following reasons:

- 1) Results of the sensitivity analysis
- 2) Discovery of errors or bugs
- 3) Improved operation of the system

The program elements affected and the modifications are described in the subsections which follow.

6.1.1 FORTTRAN PROC .BASE (Univac 1106)

In order to minimize the data storage and instruction code size requirements of the CFAS-CFAR, the dimensions of several arrays contained in COMMON (BASE) must be tailored to the number of stations or reporting sites within the CFAS window and border and the frequency of the reports. In order to facilitate the changes that are required when

the window is relocated COMMON (BASE) and an associated DATA statement have been placed in FORTRAN PROC .BASE. This permits the incorporation of these declaratory statements contained in .BASE into the several subprograms which reference them through the use of a simple INCLUDE statement. The affected subprograms are:

.BEGIN	.GET1FW
.EXEC1	.IT0J
.FIND1B	.NOSECT
.GET0B1	.STOREC
.GET1BW	.SECTOR

6.1.2 Main Program .CFMAIN/DSK (Univac 1106)

Main program .CFMAIN/DSK which runs the CFAS was revised to incorporate the findings of sensitivity analysis. The analysis control parameters whose values have now been fixed as a result of this study are now contained within DATA statements and are no longer input via READ statements. The revised input data stream now required for TASK 3 is given in Table 6.1. In addition to these changes, there has also been incorporated into .CFMAIN/DSK a provision to allow the interpreted observations to be printed out following a TASK 2. This feature is actuated by inserting a SETC command in the runstream at some point prior to the XQT command. The printout of the interpreted observations

TABLE 6.1 Input Data Stream for CFAS TASK 3

Line	Data Elements	Format
1	TASK, NPRT, NOWTYM	3I10
2	NBKOUT	I10
3	TIME, TYMOLD	2I10
5	IDENT	10A6

Data Element	Definition
TASK	TASK=3 for an analysis at all grid points in the window
NPRT	NPRT 0 the grid point analysis is printed out NPRT=0 no printout of the grid point analysis
NOWTYM	The current clock time
NBKOUT	The number of the most recent record on the CFDB file
TIME	Time of the most recent observation to be used in the analysis
TYMOLD	Time of the oldest observation to be used in the analysis
IDENT	A user defined sixty character label which identifies the CFDB record

is independent of the optional echo printout of the observations on read-in which has always existed in the CFAS.

6.1.3 Subprogram .CFMAP (Univac 1106)

A minor bug was discovered in CFMAP relating to situations in which the nearest observation to a grid point was nevertheless distant enough so as to produce a very small weighting function. The modification incorporated into CFMAP established a minimum value for the smallest weighting function. If the smallest weighting function is less than the minimum value, a missing value is inserted at the grid point for the parameter *being analyzed*.

6.1.4 Subprogram .COMOBR (Univac 1106)

The criteria for ranking observations in the building of a best report were modified and reordered. The criteria for ranking observations used in creating a best report are now applied in the following order:

- 1 - Time of observation
- 2 - Type of observation
 - 1 - Airways
 - 2 - Metar
 - 3 - Synop
 - 4 - Raob
 - 5 - AFGWC-3DNEPH
- 3 - Value of observation
- 4 - Urgency of observation
- 5 - Distance from best report site

6.1.5 Subprogram .EXEC1 (Univac 1106)

Modifications of subprogram .EXEC1 were made in connection with the use of PROC .BASE (Section 6.1.1) and the optional printout of interpreted observation (Section 6.1.2).

6.1.6 Subprogram .EXEC2 (Univac 1106)

Subprogram .EXEC2 was modified to permit the incorporation of the grid point altitudes via an INCLUDE statement. The grid point altitudes are carried in FORTRAN PROC .GRDPOINTALT.

6.1.7 FORTRAN PROC .GRDPOINTALT (Univac 1106)

The PROC .GRDPOINTALT contains the DIMENSION and DATA statements in which the array of grid point altitudes are stored. As is the case with PROC .BASE, PROC .GRDPOINTALT is dependent upon the location of the CFAS window. The use of PROC elements and the INCLUDE statements which are available on high level FORTRAN's, such as FORTRAN V, provide a convenient and relatively error safe means of entering semi-permanent parameters and constants into the CFAS elements.

6.1.8 Subprogram .SFDINT (Univac 1106)

A modification was made to subprogram .SFDINT to incorporate a test and rectification, if necessary, to insure that the maximum heights of cloud tops which are derived from weather information are equal to or greater than the observed minimum bases of clouds.

6.1.9 Subprogram .SHADE

An error was uncovered in subprogram .SHADE which resulted in the incorrect shading on most significant present weather maps of weather categories 40 - 49. The error was corrected.

7 CONCLUSIONS AND RECOMMENDATIONS

1. Reduced station density adversely affects the accuracy of the analysis at individual grid points since more distant observations must be used in analyzing the CFAS parameters at the grid point.
2. The worst objective analysis results were as expected, associated with regions having no data (silent area) and with small space and time scale phenomena, such a rapidly moving scud type clouds near the earth's surface.
3. The inclusion of older observations at stations at which there exists current observations is of value only to the extent that missing elements in the current observations can be supplemented by non-missing values in the older observations.
4. Reduced station density causes an increase in running time. This is due to the fact that the CFAS is designed to systematically search square areas of increasing size around the grid point until a minimum number of observations is found. The time required for the search is inversely proportional to the density of the observations. The time impact of observation density will have to be carefully considered when a computer is selected for operationally

implementing CFAS. It is also possible to modify and optimize the CFAS for specific observational densities and distributions. This should also be considered before implementation of the system.

5. It is possible to trade off analysis accuracy against computer time required for an analysis by varying the allowable search square control parameter.
6. Consideration should be given to handling a problem likely to exist within a battlefield environment where close and conflicting observations dictate the need for a technique that provides discrimination among reports, maintains spatial resolution, yet emphasizes operationally critical features.
7. The distance and time factors used to weight the influence of distant observations to a grid point value proved totally adequate to handle all meteorological variables tested, with the possible exception of visibility which should be explored more thoroughly in view of its importance to many Army operations.
8. No instabilities were detected in the CFAS analysis procedures.
9. A most significant result of this study was the establishment of the fact that the CFAS/CFAR objective analysis and display techniques remained stable and continued to perform under excessive variations of control parameters and type, distribution, and density of

observations. This made it possible to fix control parameters and eliminate these as user inputs. The computer programs have been modified to incorporate these advances and a Univac 1100 series compatible tape containing the new program has been delivered to Atmospheric Sciences Laboratory.

10. Presentations of the CFAS and CFAR analyses should be made to Army personnel to demonstrate some possible types of output, to solicit critical comments and support, and to generate a list of additional products that would increase the value to Army users.

8 APPENDICES

8.1 UTILITY PROGRAM LISTINGS

```

PROGRAM COLUMN
DIMENSION PAGE(55,5,20)
DOUBLE PRECISION INFILE,OUTFIL
LOGICAL EOF
EOF=.FALSE.

TYPE 1
1 FORMAT (' INPUT INFILE,EXT,INUNIT,IOUT,EXT,OUTUNT')
ACCEPT *, INFILE,INUNIT,OUTFIL,IOUT
OPEN (UNIT=INUNIT,FILE=INFILE,ACCESS='SEQIN')
OPEN (UNIT=IOUT,FILE=OUTFIL,ACCESS='SEQOUT')

5 DO 2 I=1,5
  DO 2 J=1,55
  DO 2 K=1,20
2 PAGE(J,I,K)=' '

  DO 10 I=1,5
    DO 20 J=1,55
      READ (INUNIT,30,END=31) (PAGE(J,I,K),K=1,20)
20 CONTINUE
10 CONTINUE
30 FORMAT (20A1)
35 DO 40 J=1,55
  WRITE (IOUT,60) ((PAGE(J,I,K),K=1,20),I=1,5)
40 CONTINUE
  WRITE (IOUT,11)
11 FORMAT (16X,100('*'))
60 FORMAT (1X,3(20A1,8X),20A1,7X,20A1)
  IF (.NOT. EOF) GOTO 5
  GOTO 99
31 EOF=.TRUE.
  GOTO 35
99 CONTINUE
END

```



```

PROGRAM CONVER
INTEGER ALT,EST,NTH,LAB,DEG,DEG1,MIN,MIN1,NEXLAB
REAL REFLON,REFLAT,CMRD,REFEST,REFNTH,LON,LAT,EAST,NORTH
OPEN (UNIT=20,FILE='JACK.DAT')
OPEN (UNIT=22,FILE='RAPP.DAT')
TYPE 1
1 FORMAT (' REFERENCE LONG')
ACCEPT*,REFLON
TYPE 2
2 FORMAT (' REFLAT')
ACCEPT*,REFLAT
TYPE 3
3 FORMAT (' CMRD')
ACCEPT*,CMRD
WRITE (5,4) REFLON,REFLAT,CMRD
4 FORMAT (3F10.3)
LABEL=0
CALL UTM (REFLON,REFLAT,REFEST,REFNTH,CMRD)
READ (20,20) STATIN,DEG,MIN,DEG1,MIN1,ALT
LON=FLOAT(DEG)+(FLOAT(MIN)/60.)
LAT=FLOAT(DEG1)+(FLOAT(MIN1)/60.)
CALL UTM (LON,LAT,EAST,NORTH,CMRD)
EST=INT(1000.*(EAST-REFEST))
NTH=INT(1000.*(NORTH-REFNTH))
WRITE (22,30) STATIN,EST,NTH,ALT
20 READ (20,20,END=50) STATIN,DEG,MIN,DEG1,MIN1,ALT
LABEL=LABEL+10
LON=FLOAT(DEG)+(FLOAT(MIN)/60.)
LAT=FLOAT(DEG1)+(FLOAT(MIN1)/60.)
CALL UTM (LON,LAT,EAST,NORTH,CMRD)
EST=INT(1000.*(EAST-REFEST))
NTH=INT(1000.*(NORTH-REFNTH))
NEXLAB=LABEL+10
WRITE (22,40) LABEL,STATIN,NEXLAB,EST,NTH,ALT
GOTO 10
20 FORMAT (A,5I)
30 FORMAT (6X,17HIF (STATIN .NE. ',A3,10H') GOTO 10,/,10X,'JX=',I5,
+
/,10X,'JY=',I5,/,10X,'JZ=',I5,/,10X,'GOTO 500')
40 FORMAT (2X,I3,1X,17HIF (STATIN .NE. ',A3,7H' GOTO ,I3,/,10X,'JX=',
+
I5,/,10X,'JY=',I5,/,10X,'JZ=',I5,/,10X,'GOTO 500')
50 CONTINUE
END
SUBROUTINE UTM(LON,LAT,EAST,NORTH,CMRD)
REAL LAT,LON,NORTH
A=63.782064
ARED=63.350345
E=.0068147849
Q=.017453292*LAT
P=3600.*(CMRD-LON)
C=COS(Q)
S=SIN(Q)

```

```

T=S/C
S2=2.*S*C
D=1.-(2.*S*S)
S4=2.*S2*D
RHO=A/SQRT(1.-(6.7686580E-03*S*S))
D=Q+(.005076492*(Q-(.5*S2)))+
+ (4.29513E-05*((1.5*Q)-S2+(S4/8.)))
XN1=ARED*D
D=C*S*1.1752215E-11*P*P
D=D+((C**3)*S*2.3015189E-23*(P**4)*
+ (5.-(T*T)+(9.*((E*C)**2))+(4.*((E*C)**4))))
NORTH=.9996*(XN1+(D*RHO))
D=C*4.8481368E-06*P
D=D+((C**3)*(1.-(T*T)+((E+C)**2))*1.8992115E-17*(P**3))
EAST=(RHO*D*.9996)+5
RETURN
END

```

```

PROGRAM SYNOP
INTEGER INUNIT,OUTUNT,TESTER,DATE,TIME,LAYERS,WETHRS,VISIBL,
+   MISSNG,N,NH,CL,H,CM,CH,W,WW,PPP,TT,TDTD,JX,JY,JZ,TYPEC
DOUBLE PRECISION INFILE,OUTFIL
DIMENSION TEST(7)

TYPE 10
10 FORMAT (' NAME THE INPUT UNIT AND INPUT FILE,EXT')
ACCEPT *, INUNIT,INFILE

TYPE 20
20 FORMAT (' NAME THE OUTPUT UNIT AND OUTPUT FILE,EXT')
ACCEPT *, OUTUNT,OUTFIL

OPEN (UNIT= INUNIT, FILE= INFILE, ACCESS='SEQIN')
OPEN (UNIT= OUTUNT, FILE= OUTFIL, ACCESS='SEQOUT')

MISSNG= -32768
TYPEC= 3

30 READ (INUNIT,100, END= 90, ERR= 40) TESTER
REREAD 110, DATE,TIME
READ (INUNIT,120) (TEST(I),I=1,5)

40 REREAD 130, STATIN, TYPE, LAYERS, WETHRS, VISIBL
REREAD 120, (TEST(I),I=1,5)
IF (TEST(5) .EQ. ' ') VISIBL=MISSNG
IF (TYPE .NE. 'C' .OR. LAYERS .NE. 0 .OR. WETHRS .NE. 1) GOTO 70

READ (INUNIT,110) N,NH,CL,H,CM,CH,W
REREAD 120, (TEST(I),I=1,7)
IF (TEST(1) .EQ. ' ') N=MISSNG
IF (TEST(2) .EQ. ' ') NH=MISSNG
IF (TEST(3) .EQ. ' ') CL=MISSNG
IF (TEST(4) .EQ. ' ') H=MISSNG
IF (TEST(5) .EQ. ' ') CM=MISSNG
IF (TEST(6) .EQ. ' ') CH=MISSNG
IF (TEST(7) .EQ. ' ') W=MISSNG

READ (INUNIT,100,ERR=50) TESTER
REREAD 110, WW
GOTO 60
50 WW=MISSNG

60 READ (INUNIT,110) PPP, TT, TDTD
REREAD 120, (TEST(I),I=1,3)
IF (TEST(1) .EQ. ' ') PPP= MISSNG
IF (TEST(2) .EQ. ' ') TT= MISSNG
IF (TEST(3) .EQ. ' ') TDTD= MISSNG

```

```

CALL CONVRT (STATIN,JX,JY,JZ,TIME,ITIME)
WRITE (OUTUNT,140) JX,JY,JZ,ITIME,TYPEC,VISIBL,LAYERS
WRITE (OUTUNT,140) N,NH,CL,H,CM,CH,W
WRITE (OUTUNT,140) WW,MISSNG,MISSNG,MISSNG,MISSNG,MISSNG,MISSNG
GOTO 30

70 TYPE 80,DATE,TIME,STATIN,TYPE,LAYERS,WETHRS,VISIBL
80 FORMAT (' ERROR AT ',2I7,2A5,3I4)
90 CONTINUE

100 FORMAT (I1)
110 FORMAT (8I)
120 FORMAT (8A)
130 FORMAT (2A,3I)
140 FORMAT (8I10)
END
SUBROUTINE CONVRT (STATIN,JX,JY,JZ,TIME,ITIME)
INTEGER JX,JY,JZ,TIME,HOURS,MIN

HOURS=TIME/100
MIN=TIME-(HOURS*100)
ITIME=(HOURS*60)+MIN

IF (STATIN .NE. 'ABY') GOTO 10
  JX= 5821
  JY= 2058
  JZ= 60
  GOTO 500
10 IF (STATIN .NE. 'AGS') GOTO 20
  JX= 7834
  JY= 4169
  JZ= 45
  GOTO 500
20 IF (STATIN .NE. 'AHN') GOTO 30
  JX= 6552
  JY= 4764
  JZ= 247
  GOTO 500
30 IF (STATIN .NE. 'AQQ') GOTO 40
  JX= 5097
  JY= 46
  JZ= 11
  GOTO 500
40 IF (STATIN .NE. 'ATL') GOTO 50
  JX= 5527
  JY= 4400
  JZ= 315
  GOTO 500
50 IF (STATIN .NE. 'AYS') GOTO 60
  JX= 7531
  JY= 1801

```

```
      JZ= 46
      GOTO 500
60 IF (STATIN .NE. 'AVL') GOTO 70
      JX= 7204
      JY= 6439
      JZ= 661
      GOTO 500
70 IF (STATIN .NE. 'BHM') GOTO 80
      JX= 3378
      JY= 4278
      JZ= 192
      GOTO 500
80 IF (STATIN .NE. 'BNA') GOTO 90
      JX= 3431
      JY= 7106
      JZ= 184
      GOTO 500
90 IF (STATIN .NE. 'BVE') GOTO 100
      JX= 816
      JY= -389
      JZ= 0
      GOTO 500
100 IF (STATIN .NE. 'CHA') GOTO 110
      JX= 4788
      JY= 5919
      JZ= 210
      GOTO 500
110 IF (STATIN .NE. 'GSP') GOTO 120
      JX= 7521
      JY= 5861
      JZ= 296
      GOTO 500
120 IF (STATIN .NE. 'HSV') GOTO 130
      JX= 3360
      JY= 5479
      JZ= 196
      GOTO 500
130 IF (STATIN .NE. 'JAN') GOTO 140
      JX= 243
      JY= 2934
      JZ= 101
      GOTO 500
140 IF (STATIN .NE. 'MCN') GOTO 150
      JX= 6288
      JY= 3367
      JZ= 110
      GOTO 500
150 IF (STATIN .NE. 'MEI') GOTO 160
      JX= 1499
      JY= 2924
      JZ= 94
```

```

      GOTO 500
160 IF (STATIN .NE. 'MEM') GOTO 170
      JX= 425
      JY= 5963
      JZ= 87
      GOTO 500
170 IF (STATIN .NE. 'MGM') GOTO 180
      JX= 3711
      JY= 2875
      JZ= 62
      GOTO 500
180 IF (STATIN .NE. 'MOB') GOTO 190
      JX= 1949
      JY= 1089
      JZ= 67
      GOTO 500
190 IF (STATIN .NE. 'MSY') GOTO 200
      JX= 9
      JY= 351
      JZ= 9
      GOTO 500
200 IF (STATIN .NE. 'PNS') GOTO 210
      JX= 2954
      JY= 842
      JZ= 36
      GOTO 500
210 IF (STATIN .NE. 'SPA') GOTO 220
      JX= 7764
      JY= 5891
      JZ= 251
      GOTO 500
220 IF (STATIN .NE. 'TLH') GOTO 230
      JX= 5677
      JY= 779
      JZ= 21
      GOTO 500
230 IF (STATIN .NE. 'TYS') GOTO 240
      JX= 5873
      JY= 6815
      JZ= 299
      GOTO 500

240 TYPE 250,STATIN
250 FORMAT (' YOU BLEW IT AT STATION ',A5)

500 CONTINUE
      RETURN
      END

```



```

PROGRAM AIRWAY
INTEGER JX,JY,JZ,TIME,TYPE,VISIBL,LAYERS,WETHRS,IVISC,ICLG,ICLGV,
+ COVAGE(10),HEIGHT(10),THIN(10),WEATHR(7),PRESSR,TEMP,
+ DEWPT,MISSNG,INUNIT,OUTUNT
LOGICAL EOF
DOUBLE PRECISION INFILE,OUTFIL
COMMON MISSNG,INUNIT,OUTUNT
MISSNG= -32768
EOF= .FALSE.
TYPE 10
10 FORMAT (' NAME THE FILE,EXT OF THE INPUT FILE')
ACCEPT *, INFILE
TYPE 20
20 FORMAT (' TYPE THE LOGICAL UNIT NUMBER OF THE INPUT FILE')
ACCEPT *, INUNIT
TYPE 30
30 FORMAT (' TYPE THE OUTPUT FILE,EXT')
ACCEPT *, OUTFIL
TYPE 40
40 FORMAT (' TYPE THE LOGICAL UNIT NUMBER OF THE OUTPUT FILE')
ACCEPT *, OUTUNT
OPEN (UNIT= INUNIT, FILE= INFILE, ACCESS='SEQIN')
OPEN (UNIT= OUTUNT, FILE= OUTFIL, ACCESS='SEQOUT')
50 CALL ID (JX,JY,JZ,TIME,TYPE,VISIBL,LAYERS,WETHRS,IVISC,EOF)
IF (EOF) GOTO 60
CALL CLOUDS (LAYERS,ICLG,ICLGV,COVAGE,HEIGHT,THIN)
CALL WETHR (WETHRS,WEATHR,PRESSR,TEMP,DEWPT)
CALL PRINT (JX,JY,JZ,TIME,TYPE,VISIBL,LAYERS,ICLG,
+ ICLGV,IVISC,WEATHR,COVAGE,HEIGHT,THIN)
GOTO 50
60 CONTINUE
END

SUBROUTINE ID (JX,JY,JZ,TIME,TYPE,VISIBL,LAYERS,WETHRS,IVISC,EOF)
INTEGER JX,JY,JZ,TIME,TYPE,VISIBL,LAYERS,WETHRS,IVISC,DATE
REAL VISIB
LOGICAL EOF
DIMENSION TEST(5),LINE(20)
COMMON MISSNG,INUNIT,OUTUNT
READ (INUNIT,40,END=20) (TEST(I),I=1,5)
IF (TEST(4) .EQ. ',') GOTO 10
IF (TEST(5) .EQ. ',') GOTO 5
TYPE 4,(TEST(I),I=1,5)
4 FORMAT (' ERROR ',5A2)
DO 7 J=1,10
READ (INUNIT,9) (LINE(I),I=1,20)
TYPE 11, (LINE(I),I=1,20)
7 CONTINUE
STOP
9 FORMAT (20A1)
11 FORMAT (1X,20A1)

```

```

5 REREAD 50, DATE, TIME
  TIME=NEWTIM(TIME)
  READ (INUNIT,60) (TEST(I),I=1,5)
10 REREAD 60, (TEST(I),I=1,5)
  REREAD 70, STATIN,ITYPE,LAYERS,WETHRS,VISIB
  CALL CONVRT (STATIN,JX,JY,JZ,ITYPE,TYPE,VISIB,VISIBL,IVISC)
  IF (TEST(3) .EQ. ' ') LAYERS=MISSNG
  IF (TEST(4) .EQ. ' ') WETHRS=MISSNG
  IF (TEST(5) .EQ. ' ') VISIBL=MISSNG
  GOTO 30
20 EOF=.TRUE.
30 CONTINUE
40 FORMAT (5A1)
50 FORMAT (2I)
60 FORMAT (5A)
70 FORMAT (2A,2I,F)
  RETURN
  END

```

```

INTEGER FUNCTION NEWTIM (TIME)
INTEGER HOURS,MIN,TIME
HOURS=TIME/100
MIN=TIME-(HOURS*100)
NEWTIM=(HOURS*60)+MIN
RETURN
END

```

```

SUBROUTINE CONVRT (STATIN,JX,JY,JZ,ITYPE,TYPE,VISIB,
+ VISIBL,IVISC)
INTEGER JX,JY,JZ,TYPE,TIME,IVISC,HOURS,MIN,VISIBL
REAL VISIB
COMMON MISSNG,INUNIT,OUTUNT
DIMENSION LINE(20)
IF (STATIN .NE. 'ABY') GOTO 10
  JX= 5821
  JY= 2058
  JZ= 60
  GOTO 500
10 IF (STATIN .NE. 'AGS') GOTO 20
  JX= 7834
  JY= 4169
  JZ= 45
  GOTO 500
20 IF (STATIN .NE. 'AHN') GOTO 30
  JX= 6552
  JY= 4764
  JZ= 247
  GOTO 500
30 IF (STATIN .NE. 'AMG') GOTO 40
  JX= 9314
  JY= 2207

```

AD-A071 452

GEO-ATMOSPHERICS CORP LINCOLN MA

F/G 4/2

SENSITIVITY STUDY OF CFAS AND CFAR OBJECTIVE ANALYSIS TECHNIQUE--ETC(U)

FEB 79 W D MOUNT, B R FOW, B D MOUNT

DAEA18-76-C-0060

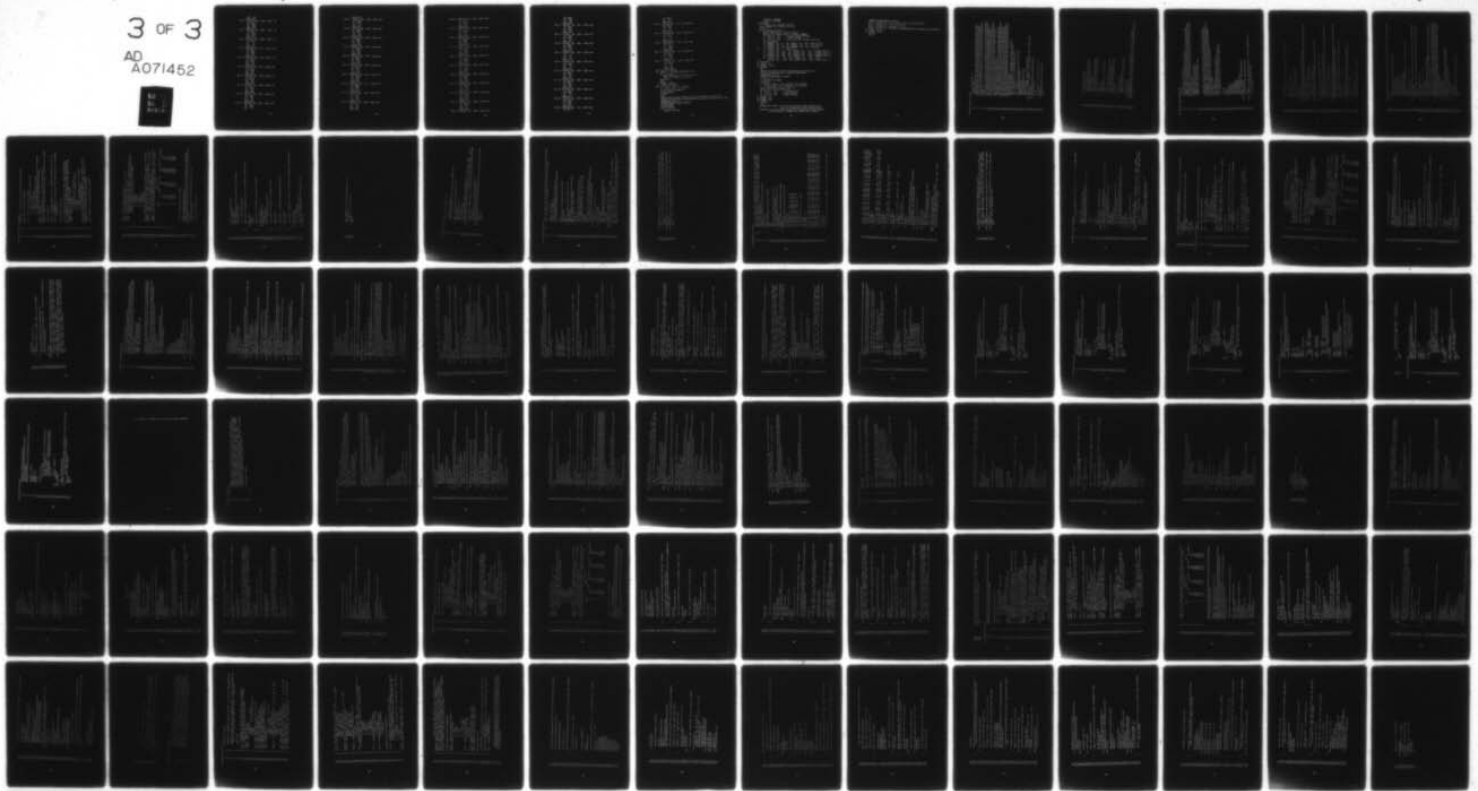
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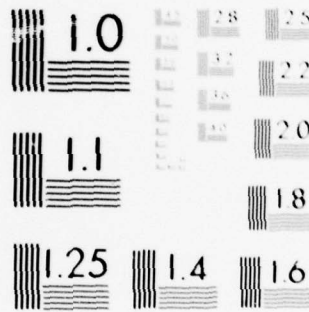
UNCLASSIFIED

3 OF 3

AD
A071452



END
DATE
FILMED
9-79
DDC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

```
      JZ= 63
      GOTO 500
40 IF (STATIN .NE. 'ANB') GOTO 50
      JX= 4214
      JY= 4302
      JZ= 188
      GOTO 500
50 IF (STATIN .NE. 'AND') GOTO 60
      JX= 7082
      JY= 5396
      JZ= 236
      GOTO 500
60 IF (STATIN .NE. 'ARQ') GOTO 70
      JX= 5097
      JY= 46
      JZ= 11
      GOTO 500
70 IF (STATIN .NE. 'ATL') GOTO 80
      JX= 5527
      JY= 4400
      JZ= 315
      GOTO 500
80 IF (STATIN .NE. 'AYS') GOTO 90
      JX= 7531
      JY= 1801
      JZ= 46
      GOTO 500
90 IF (STATIN .NE. 'AVL') GOTO 100
      JX= 7204
      JY= 6439
      JZ= 661
      GOTO 500
100 IF (STATIN .NE. 'BHM') GOTO 110
      JX= 3378
      JY= 4278
      JZ= 192
      GOTO 500
110 IF (STATIN .NE. 'BNA') GOTO 120
      JX= 3431
      JY= 7106
      JZ= 184
      GOTO 500
120 IF (STATIN .NE. 'BTR') GOTO 130
      JX= -837
      JY= 989
      JZ= 23
      GOTO 500
130 IF (STATIN .NE. 'BVE') GOTO 140
      JX= 816
      JY= -389
      JZ= 0
```

```
      GOTO 500
140 IF (STATIN .NE. 'CEW') GOTO 150
      JX= 3609
      JY= 1194
      JZ=  56
      GOTO 500
150 IF (STATIN .NE. 'CHA') GOTO 160
      JX= 4788
      JY= 5919
      JZ=  210
      GOTO 500
160 IF (STATIN .NE. 'CKV') GOTO 170
      JX= 2804
      JY= 7642
      JZ=  166
      GOTO 500
170 IF (STATIN .NE. 'CSG') GOTO 180
      JX= 5088
      JY= 3133
      JZ=  120
      GOTO 500
180 IF (STATIN .NE. 'CSV') GOTO 190
      JX= 4875
      JY= 6938
      JZ=  570
      GOTO 500
190 IF (STATIN .NE. 'DHN') GOTO 200
      JX= 4621
      JY= 1794
      JZ=  113
      GOTO 500
200 IF (STATIN .NE. 'DYP') GOTO 210
      JX=  983
      JY= 7021
      JZ=  105
      GOTO 500
210 IF (STATIN .NE. 'FTY') GOTO 220
      JX= 5446
      JY= 4546
      JZ=  257
      GOTO 500
220 IF (STATIN .NE. 'GLH') GOTO 230
      JX= -556
      JY= 4256
      JZ=  40
      GOTO 500
230 IF (STATIN .NE. 'GNV') GOTO 240
      JX= 7731
      JY=  86
      JZ=  50
      GOTO 500
```



```
240 IF (STATIN .NE. 'GSP') GOTO 250
      JX= 7521
      JY= 5861
      JZ= 296
      GOTO 500
250 IF (STATIN .NE. 'GWO') GOTO 260
      JX= 173
      JY= 4250
      JZ= 41
      GOTO 500
260 IF (STATIN .NE. 'HSV') GOTO 270
      JX= 3360
      JY= 5479
      JZ= 196
      GOTO 500
270 IF (STATIN .NE. 'JAN') GOTO 280
      JX= 243
      JY= 2934
      JZ= 101
      GOTO 500
280 IF (STATIN .NE. 'JBR') GOTO 290
      JX= -151
      JY= 6853
      JZ= 805
      GOTO 500
290 IF (STATIN .NE. 'MCB') GOTO 300
      JX= -155
      JY= 1780
      JZ= 143
      GOTO 500
300 IF (STATIN .NE. 'MCN') GOTO 310
      JX= 6288
      JY= 3367
      JZ= 110
      GOTO 500
310 IF (STATIN .NE. 'MEI') GOTO 320
      JX= 1499
      JY= 2924
      JZ= 94
      GOTO 500
320 IF (STATIN .NE. 'MEM') GOTO 330
      JX= 425
      JY= 5963
      JZ= 87
      GOTO 500
330 IF (STATIN .NE. 'MGM') GOTO 340
      JX= 3711
      JY= 2875
      JZ= 62
      GOTO 500
340 IF (STATIN .NE. 'MGR') GOTO 350
```

```
JX= 6200
JY= 1569
JZ= 88
GOTO 500
350 IF (STATIN .NE. 'MKL') GOTO 360
    JX= 1410
    JY= 6549
    JZ= 129
    GOTO 500
360 IF (STATIN .NE. 'MOB') GOTO 370
    JX= 1949
    JY= 1089
    JZ= 67
    GOTO 500
370 IF (STATIN .NE. 'MSL') GOTO 380
    JX= 2582
    JY= 5592
    JZ= 171
    GOTO 500
380 IF (STATIN .NE. 'MSY') GOTO 390
    JX= 9
    JY= 351
    JZ= 9
    GOTO 500
390 IF (STATIN .NE. 'NEW') GOTO 400
    JX= 220
    JY= 400
    JZ= 3
    GOTO 500
400 IF (STATIN .NE. 'PNS') GOTO 410
    JX= 2954
    JY= 842
    JZ= 36
    GOTO 500
410 IF (STATIN .NE. 'RMG') GOTO 420
    JX= 4833
    JY= 5162
    JZ= 196
    GOTO 500
420 IF (STATIN .NE. 'SFB') GOTO 430
    JX= 8769
    JY= -886
    JZ= 2
    GOTO 500
430 IF (STATIN .NE. 'SPA') GOTO 440
    JX= 7764
    JY= 5891
    JZ= 251
    GOTO 500
440 IF (STATIN .NE. 'TCL') GOTO 450
    JX= 2572
```

```

        JY= 3910
        JZ=  57
        GOTO 500
450 IF (STATIN .NE. 'TIX') GOTO 460
        JX= 9227
        JY=-1161
        JZ=  11
        GOTO 500
460 IF (STATIN .NE. 'TLH') GOTO 470
        JX= 5677
        JY=  779
        JZ=  21
        GOTO 500
470 IF (STATIN .NE. 'TUF') GOTO 480
        JX= 1520
        JY= 5068
        JZ=  110
        GOTO 500
480 IF (STATIN .NE. 'TYS') GOTO 490
        JX= 5873
        JY= 6815
        JZ=  299
        GOTO 500
490 IF (STATIN .NE. 'VLD') GOTO 495
        JX= 6705
        JY= 1252
        JZ=  66
        GOTO 500
495 TYPE 497,STATIN
497 FORMAT (' STATIN ERROR WITH',A5)
    DO 7 J=1,10
        READ (INUNIT,9) (LINE(I),I=1,20)
        TYPE 11, (LINE(I),I=1,20)
    7 CONTINUE
    STOP
    9 FORMAT (20A1)
    11 FORMAT (1X,20A1)
500 IF (ITYPE .EQ. 'A') TYPE=1
    IF (ITYPE .EQ. 'S') TYPE=-1
    VISIBL=INT(VISIB*100.)
    IVISC=MISSNG
    RETURN
    END
    SUBROUTINE CLOUDS (LAYERS,ICLG,ICLGV,COVAGE,HEIGHT,THIN)
    INTEGER LAYERS,ICLG,ICLGV,COVAGE(10),HEIGHT(10),THIN(10),LAYER
    DIMENSION TEST(5)
    COMMON MISSNG,INUNIT,OUTUNT
    ICLG=MISSNG
    ICLGV=MISSNG
    DO 10 I=1,10
        THIN(I)=MISSNG

```

```

        COVAGE(I)=MISSNG
        HEIGHT(I)=MISSNG
10  CONTINUE
    IF (LAYERS .NE. MISSNG) GOTO 20
    READ (INUNIT,50) (TEST(I),I=1,3)
    GOTO 40
20  DO 40 LAYER=1,LAYERS
    READ (INUNIT,50) (TEST(I),I=1,3)
    REREAD 60, HEIGHT(LAYER), COVRGE, HOWMES
    IF (TEST(1) .EQ. ' ') HEIGHT(LAYER)=MISSNG
    IF (TEST(2) .EQ. ' ') COVRGE=MISSNG
    IF (TEST(3) .EQ. ' ' .OR. ICLG .NE. MISSNG) GOTO 30
    ICLG=LAYER*10
    IF (HOWMES .EQ. 'M' .OR. HOWMES .EQ. 'MV') ICLG=ICLG+1
    IF (HOWMES .EQ. 'E' .OR. HOWMES .EQ. 'EV') ICLG=ICLG+5
    IF (HOWMES .EQ. 'MV' .OR. HOWMES .EQ. 'EV') ICLGV=1
30  IF (COVRGE .EQ. ' ') GOTO 40
    IF (COVRGE .EQ. 'CLR' .OR. COVRGE .EQ. '-CLR') COVAGE(LAYER)=0
    IF (COVRGE .EQ. 'SCT' .OR. COVRGE .EQ. '-SCT') COVAGE(LAYER)=3
    IF (COVRGE .EQ. 'BKN' .OR. COVRGE .EQ. '-BKN') COVAGE(LAYER)=6
    IF (COVRGE .EQ. 'OVC' .OR. COVRGE .EQ. '-OVC') COVAGE(LAYER)=8
    IF (COVRGE .EQ. '-CLR' .OR. COVRGE .EQ. '-SCT' .OR.
+      COVRGE .EQ. '-BKN' .OR. COVRGE .EQ. '-OVC') THIN(LAYER)=1
40  CONTINUE
50  FORMAT (3A)
60  FORMAT (I,2A)
    RETURN
    END
    SUBROUTINE WETHRS (WETHRS,WEATHR,PRESSR,TEMP,DEWPT)
    INTEGER WETHRS,WEATHR(7),PRESSR,TEMP,DEWPT
    DIMENSION TEST(3)
    COMMON MISSNG,INUNIT,OUTUNT
    DO 10 I=1,7
        WEATHR(I)=MISSNG
10  CONTINUE
    IF (WETHRS .NE. 0 .AND. WETHRS .NE. MISSNG)
+    READ (INUNIT,20) (WEATHR(I),I=1,WETHRS)
    READ (INUNIT,30) (TEST(I),I=1,3)
    REREAD 40, PRESSR,TEMP,DEWPT
    IF (TEST(1) .EQ. ' ') PRESSR=MISSNG
    IF (TEST(2) .EQ. ' ') TEMP=MISSNG
    IF (TEST(3) .EQ. ' ') DEWPT=MISSNG
20  FORMAT (7I)
30  FORMAT (3A)
40  FORMAT (3I)
    RETURN
    END
    SUBROUTINE PRINT (JX,JY,JZ,TIME,TYPE,VISIBL,LAYERS,ICLG,
+      ICLGV,IVISC,WEATHR,COVAGE,HEIGHT,THIN)
    INTEGER JX,JY,JZ,TIME,TYPE,VISIBL,LAYERS,ICLG,ICLGV,OUTUNT,
+      IVISC,WEATHR(7),COVAGE(10),HEIGHT(10),THIN(10)

```

```
COMMON MISSNG,INUNIT,OUTUNT
WRITE (OUTUNT,10) JX,JY,JZ,TIME,TYPE,VISIBL,LAYERS
WRITE (OUTUNT,10) ICLG,ICLGV,IVISC
WRITE (OUTUNT,10) (WEATHR(I),I=1,7)
WRITE (OUTUNT,20) (COVAGE(I),MISSNG,HEIGHT(I),THIN(I),I=1,LAYERS)
10 FORMAT (8I10)
20 FORMAT (4I10)
RETURN
END
```



```

CFAS*CFASS(1),NEWUTM
1  SEAL LAT, LONG, NORTH
2  INTEGER UTMX
3  DIMENSION UTMX(50)/5821, 7834, 5552, 9314, 4214, 7082, 5097, 5527, 7531,
4  $7204, 3278, 3431, -837, 816, 3609, 4738, 5083, 4975, 4621, 983, 5446, -556,
5  $7731, 7521, 173, 3360, 243, -151, -155, 2288, 1499, 425, 2711, 1410, 1949,
6  $2582, 9, 220, 2954, 4833, 7764, 2572, 5077, 1520, 5673, 6705, 2227, 3769, 6200,
7  $2804/
8  DIMENSION LAT(50)/31.5333, 33.36667, 33.95, 31.5333, 32.5833, 34.5,
9  $29.7333, 33.65, 31.25, 35.4333, 33.56667, 36.11667, 30.5333, 29.3333,
10 $30.7833, 35.0333, 32.51667, 35.97, 31.31667, 38.01667, 33.7833,
11 $33.4833, 29.7, 24.5, 33.5, 34.65, 32.31667, 35.8333, 31.26667, 32.7,
12 $32.3333, 35.05, 32.3, 35.6, 30.5833, 34.75, 29.4833, 30.0333, 30.46667,
13 $, 24.35, 34.91667, 33.2333, 20.3833, 30.16667, 35.81667, 30.7833,
14 $28.516667, 28.7833, 31.0933, 33.5, 6/
15 DIMENSION LONG(50)/84.1833, 81.96667, 83.31667, 82.51667, 85.85,
16 $82.71667, 84.9833, 84.4333, 82.4, 82.5333, 86.75, 86.6833, 91.15, 89.4
17 $, 86.51667, 85.2, 84.9333, 85.0833, 85.445, 89.4, 84.51667, 90.9823,
18 $82.26667, 82.21667, 90.2, 96.75667, 90.0833, 90.65, 90.46667, 83.65,
19 $88.75, 89.9833, 86.4, 88.91667, 88.25, 87.01667, 90.25, 90.0333, 87.2,
20 $85.16667, 81.95, 87.61667, 84.36667, 88.75667, 83.9833, 83.2933, 80.8,
21 $81.25, 83.8, 87.3833/
22 DIMENSION NUTMX(50), NUTMY(50), LINE(7), LINEI(14)
23 DATA CLAT/30.68333/, CLONG/89.00/, CNITMR/85.5/
24 CALL UTM(CLONG, CLAT, CEAST, CNORTH, CNTMR)
25 DO 5 I=1,50
26 CALL UTM(LONG(I), LAT(I), EAST, NORTH, CNTMR)
27 RELX=(EAST-CEAST)*1000.
28 NUTMX(I)=RELX
29 RELY=(NORTH-CNORTH)*1000.
30 NUTMY(I)=RELY
31 WRITE (6,3000) I, NUTMX(I), NUTMY(I)
32 3000 FORMAT (10X, 'STATION # ', I3, ' NUTMX=', I5, ' NUTMY=', I6)
33 5 CONTINUE
34 10 READ (11,80,END=40) (LINE(J), J=1,7)
35 DO 15 I=1,50
36 TPTEI
37 15 (LINE(I), 50, UTMX(I)) GO TO 20
38 15 CONTINUE
39 WRITE (6,2000) LINE(1), LINE(2)
40 STOP

```



```

41 20 LINE(1)=NUMY(IPT)
42   LINE(2)=NUMY(IPT)
43   IF (LINE(7) .LT. 0) GO TO 30
44   WRITE (12,80) (LINE(J),J=1,7)
45   LINES=LINES(7) + 2
46   DO 35 I=1,LINES
47     READ (11,90) (LINE1(J),J=1,14)
48     WRITE (12,90) (LINE1(J),J=1,14)
49   CONTINUE
50   GO TO 10
51 30 LINE(7)=0
52   WRITE (12,90) (LINE1(J),J=1,7)
53   LINES=7
54   DO 35 I=1,LINES
55     READ (11,90) (LINE1(J),J=1,14)
56     IF (I .EQ. LINES) GO TO 35
57     WRITE (12,90) (LINE1(J),J=1,14)
58   CONTINUE
59   GO TO 10
60   CEACT=CEACT+100.
61   CNDRTH=CNDRTH+100.
62   WRITE (6,2010) CNDRTH,CEACT,CNTM2
63   STOP
64   80 FORMAT(7I10)
65   90 FORMAT(14E5)
66   2000 FORMAT(5X,'NO STATION WITH COORDINATES Y=',I5,' , Y=',I5)
67   2010 FORMAT(5X,'DATA YTRC/','F7.2','%','XZFO/','F7.2','%','CNTMP/','F6.2','%','')
68   END

```

```

CFASD(CFASD(1),CFMAIN/STAT1
1      C
2      C
3      TEST DRIVER FOR THE CFAS
4      INTEGER TASK,TIME,TIMEOLD,CFASD,GRDPRV,GRD
5      COMMON /IDAT/ JX,JY,JZ,ITIME,IOBC,ITYPE,IVALU,NTCLC,NCEIL,NVV,
6      *MTNBAS,MAXTOP,MPWSE,LCOV(9),ICL,ITSC,ICM,ICH,ICIS(10),NWEA(7),IPW,
7      *IWD,IWS,IPPP,ITT,ITD,IVIS,NH,IH,NS(10),IHS(10),IHN(10),ICLG,ICLGV
8      *IVISC,NOUSE(59)
9      COMMON /CLOCKT/NCNTYM,LASISK
10     COMMON /MAP/ XREF,YREF,CMPD
11     COMMON /OUTP/IBEG,IEND,JBEG,JEND
12
13     DIMENSION IDAT(143),JDAT(143),IZ(30),IP(30),IT(30),IO(30),
14     *CFASD(5010),GRDPRV(20,20,15),IDENT(10),Z(30),P(30),I(30),OD(30)
15     EQUIVALENCE (IDAT(1),JX),(JDAT(23),ICL,IZ(1)),(IDAT(53),NS(1),IP(1
16     *)),(IDAT(83),ICLG,IT(1)),(IDAT(113),IDC(1)),(IDAT(143),NRPL),
17     *(CFASD(11),GRDPRV(1,1,1)),(CFASD(1),IDENT(1))
18     DATA MISS/-32763/
19     DATA NCOFF/4/
20     DATA GRD/25/,LNTHX/500/,LNTHY/500/
21     DATA XZRO/154.65/,YZRO/339.56/,CNTMEP/35.5/
22     DATA NORWRT/22/, KEIND/5/, KEIN1/5/, NWORFEC/44/
23
24     LASTEN
25     NDEF1
26     NPRTEN
27     LASTSK = 0
28     XREF=YZRO
29     YREF=YZRO
30     CMRDE=CNMTER
31     IGP=LNTHX/GRD
32     JCS=LNTHY/GRD
33     ICF08=IGP*JCS*15*10
34     5 READ (5,1000) TASK,NPRT,NCNTYM
35     1000 FORMAT(8I10)
36     WRITE (6,2000) TASK,NPRT,NCNTYM
37     MDEF1
38     2000 FORMAT('1',5X,'TASK=',I4,5X,'NPRT=',I4,5X,'NCNTYM=',I5)
39     GO TO (130,10,200,200),TASK
40     10 20 20 1,1,14?

```

```

41 20 IOA*(I)MEMYSC
42 READ (5,1000)END=140) JX,JY,JZ,ITIME,ITYPE,IIVIS,NC
43 NOPEN=1
44 MFC=IABS(ITYPE/10)
45 ITYPE=MOD(ITYPE,10)
46 MFC=IABS(ITYPE)
47 DO 10 I=1,30,10,30,100,M)
48 IF(NPT) .EQ. 0) GO TO 33
49 WRITE (6,2005)
50 FORMAT(7)
51 WRITE (6,2010)JX,JY,JZ,ITIME,ITYPE,IIVIS,NC
52 FORMAT(4X,JY,6X,JY,8X,JZ,6X,ITIME,6X,ITYPE,6X,
53 IVC,7(2X,I6,2X)/)
54 DO 10 I=1,30,10,30,100,M)
55 READ (5,1000) ICLG,ICLGV,IIVISC
56 IF(NPT) .EQ. 0) GO TO 50
57 WRITE(6,2020) ICLG,ICLGV,IIVISC
58 FORMAT(3X,ICL6,6X,ICL6V,6X,IIVISC/2(7Y,I6,2X)/)
59 GO TO 50
60 READ (5,1000) ITSC,NH,ICL,IH,ICM,ICH,IPK
61 IF(NPT) .EQ. 0) GO TO 50
62 WRITE(6,2030) ITSC,NH,ICL,IH,ICM,ICH,IPK
63 FORMAT(3X,ITSC,7X,NH,7X,ICL,6X,IH,7X,ICM,7X,ICH,7X,IP
64 K,7(2X,I6,2X)/)
65 READ (5,1000) NWEA(I),I=1,7)
66 IF(NPT) .EQ. 0) GO TO 55
67 WRITE (6,2035) (NWEA(I),I=1,7)
68 FORMAT(2X,NWEA(1)),3X,NWEA(2)),7X,NWEA(3)),3X,NWEA(4)),3X,NWE
69 A(5)),3X,NWEA(6)),3X,NWEA(7))/7(3X,I4,3X)/)
70 IF(NC) .EQ. 0) GO TO 110
71 READ (5,1010) (NC(I),ICIS(I),ITHN(I),I=1,NC)
72 FORMAT(4I10)
73 IF(NPT) .EQ. 0) GO TO 110
74 WRITE (6,2040)
75 FORMAT(4X,NC,6X,ICIS,6X,IHS,6X,ITHN,7)
76 WRITE(6,2050) (NC(I),ICIS(I),IHS(I),ITHN(I),I=1,NC)
77 FORMAT(4(2X,I5,4X)
78 GO TO 110
79 IF(NPT) .EQ. 0) GO TO 85
80 WRITE (6,2005)
81 WRITE(6,2050) JX,JY,JZ,ITIME,ITYPE

```

```

82      2060 FORMAT(4X,'JX','BX','JY','BY','JZ','BZ','IITIME','EX','IITYPE','/5(2X,'IG,2X,')/
83      85 Z=0
84      90 Z=Z+1
85      READ (5,1000) IZ(I),IP(I),II(I),IDO(I)
86      Z(I)=FLOOR(IZ(I))
87      II(I)=I(I)+2732
88      P(I)=FLOOR(IP(I))*.1
89      P(I)=ABS(P(I))
90      Y(I)=FLOOR(Y(I))*.2
91      DO(1)=FLOOR(IDO(I))*.1
92      IF((IP(I)).GE.0) .OR. (IP(I)).EQ. MISS) GO TO 90
93      NRPLEI
94      IF(NPRT .EQ. 0) GO TO 110
95      WRITE (6,2070)
96      2070 FORMAY(9X,'I2','I0X','IP','I0X','II','I0X','IDO','I0X','Z','I2X','P','I1X','Y','
97      'I1X','00')/
98      WRITE(6,2080) (IZ(I),IP(I),II(I),IDO(I),P(I),Y(I),DO(I),Y=1,
99      'NRPL)
100     FORMAY(3X,'I2,4F12.2)
101     GO TO 110
102     IF(NPRT .EQ. 0) GO TO 105
103     WRITE (6,2005)
104     WRITE (6,2060) JX,JY,JZ,IITIME,IITYPE
105     READ (5,1000) NTCLOC,NCEIL,NVV,MINBAS,MAXT CO,MSPWE,(LCOV(I),I=1,9)
106     IF(NPRT .EQ. 0) GO TO 110
107     WRITE (6,2090) NTCLOC,NCEIL,NVV,MINBAS,MAXT CO,MSPWE,(LCOV(I),I=1,9)
108     FORMAY(3X,'I2,4F12.2','I0X','NCEIL','I0X','NVV','5X','MINBAS','4X','MAXT CO','4X','
109     'MSPWE','4X','LCOV(1)','3X','LCOV(2)'/3(2X,'I6,2X)'/2X,'LCOV(3)','3X','LCO
110     'V(4)','3X','LCOV(5)','3X','LCOV(6)','3X','LCOV(7)','3X','LCOV(8)','3X','LCOV
111     '(9)'/7(2X,'I6,2X)')/
112     GO TO 120
113     JOAT(J)=JOAT(I)
114     IF (LASTICK .EQ. 0 .AND. TACK .EQ. 2) LASTICK=3
115     CALL EXECUT(TACK,TIME,JOAT,LAST,IMOLD,NCR)
116     IF (MFE .LE. 0) GO TO 110
117     GO 150
118     IF(1,4)
119     JOAT(I)=0
120     JOAT(I)=ENOB
121     CALL BLKOUT(INPROF,JOAT,1,KFINI,Y-TAT)
122     GO 510
123     END

```

```

CFAB,CFABSS(1),EXEC1/STAT1
1 SUBROUTINE EXEC1(TASK,TIME,OBSPRT,LAST,TYMOLD,NOBR)
2
3 INPUT DATA (FORMAL PARAMETERS)
4
5 TASK = TASK REQUESTED BY FRAMS
6 1 = SET UP THE OBS/REP STORAGE FILE
7 2 = INPUT OBS/REP
8 3 = CREATE A NEW CFDB
9 4 = UPDATE THE LATEST CFDB ON FILE
10 5 = OUTPUT UPDATED COMMON BLOCK BASE TO MASS STORAGE
11
12 TIME = REFERENCE TIME OF CFDB CREATION OR UPDATE
13 OBSPRT = OBS/REP
14 LAST = SEQUENCE NUMBER OF THE LAST OBS/REP STORED.
15 TYMOLD = TIME OF OLDEST OBS/REP TO BE USED IN A CREATION OR UPDATE
16
17 DATA STATEMENTS
18
19 LCFILE = LOGICAL DEVICE NO. OF TEMPORARY STORAGE FILE USED IN
20 'COMCDB'.
21 NOBR = MAXIMUM NUMBER OF OBS/REP THAT CAN BE USED IN A CREATION
22 OR UPDATE.
23
24 OBS/REP INPUT ELEMENTS
25
26 IX = X DISTANCE OF OBS/REP SITE FROM TXREF, HECTOMETERS.
27 IY = Y DISTANCE OF OBS/REP SITE FROM TYREF, HECTOMETERS.
28 IZ = OBS/REP SITE ELEVATION ABOVE MEAN SEA LEVEL, METERS.
29 ITIME = TIME OF OBS/REP (0-1440)
30 ITYPE = TYPE OF OBS/REP
31 1 = AIRWAYS, -1 IF A SPECIAL.
32 2 = METAR, -2 IF A SPECIAL (SPECT)
33 3 = SYNOP
34 4 = UPPER AIR (RAOR), -4 IF A SPECIAL
35 5 = AFGWC 3D-NEPH OUTPUT
36 FOR EXPLANATION OF REMAINING OBS/REP INPUT ELEMENTS CONSULT
37 LISTINGS OF SUBROUTINE SPOINT IF A SURFACE OBS/REP OR
38 SUBROUTINE WADINT IF AN UPPER AIR OBS/REP.
39
40 CFDB PARAMETERS DETERMINED FROM OBS/REP.

```


41 C TOBC = SEQUENCE NO. OF OBS/REP.
 42 C TVALU = CFOB INFORMATION VALUE OF THE OBS/REP
 43 C NYCLC = TOTAL CLOUD COVER, (00 TO 100)
 44 C NCEYL = HEIGHT OF CEILING LAYER (AGL), DEKAMETERS. MINUS IF A
 45 C VARIABLE CEILING. LAST DIGIT OF NCEIL INDICATES THE
 46 C METHOD BY WHICH THE CEILING WAS DETERMINED.
 47 C 1 = MEASURED
 48 C 2 = AIRCRAFT
 49 C 3 = BALLOON
 50 C 4 = RADAR
 51 C 5 = ESTIMATED
 52 C 6 = INDEFINITE

53 C MWV = PREVAILING SURFACE VISIBILITY, METERS. MINUS IF VARIABLE.
 54 C MINBAS = HEIGHT OF BASE OF LOWEST CLOUD, DEKAMETERS.
 55 C MAXTOP = HEIGHT OF TOP OF HIGHEST CLOUD THAT COULD BE DETERMINED
 56 C FROM OBS/REP ELEMENTS, DEKAMETERS.
 57 C MSPWE = MOST SIGNIFICANT PRESENT WEATHER ELEMENT. (WMO CODE 4677)
 58 C LCCV(I) = PERCENT CLOUD COVER IN THE CFOB LAYER, (00 TO 100).
 59 C

LAYER	0 FEET	0 METERS	150 FEET	45 METERS
1	150	45	300	91
2	200	60	400	182
3	300	91	600	305
4	500	152	1000	610
5	1000	305	2000	1057
6	2000	610	3500	1524
7	3500	1057	5000	1981
8	5000	1524	6500	3048
9	6500	1981	10000	

60 C
 61 C
 62 C
 63 C
 64 C
 65 C
 66 C
 67 C
 68 C
 69 C
 70 C
 71 C
 72 C
 73 C
 74 C
 75 C
 76 C
 77 C
 78 C
 79 C
 80 C
 81 C

INTEGRO TASK, TIME, OBSRPT, T, WMOLO
 COMMON /CLOCKT/NOWTYM, LASTEX
 COMMON /CRSREP/IX, IY, IZ, ITIME, IOBC, ITYPE, TVALU, NYCLC, NCEIL, MWV,
 MINBAS, MAXTOP, MSPWE, LCCV(I), ICL, ITSC, ICM, TCH, ICTS(10), NWFA(7), ICM,
 *SOURCE (06)
 DIMENSION OBSRPT(147), WMOBR(147), F1(14), F2(7), I1(17)
 INCLUDE BASE, LIST
 EQUIVALENCE IKCR(1), IX


```

92 DATA L$FILE/3//NORR/100/
93 DATA KNUM99 /0/
94 DATA IPRY/E/
95 DATA NOBWT/22/, XFINO/5/, XFINI/6/, NKDREC/44/
96 DATA MISS/-32768/
97
98 GO TO (10,20,70,70),TASK
99
100 C COME HERE TO INITIALIZE AND SET UP OBS/REP STORAGE FILES
101 C
102 C
103 10 CALL BEGIN
104 IOBCED
105 RETURN
106
107 C COME HERE TO INTERPRET AND FILE AN OBS/REP.
108 C
109 C
110 20 DO 25 K=1,147
111 25 KOBRC(K)=OBSRPT(K)
112 IOBCELAST=1
113 NIREIABS(I,TYPE)
114 GO TO (30,30,30,40,50),NTR
115
116 C COME HERE TO INTERPRET A SURFACE OBS/REP
117 C
118 C
119 30 CALL SFDINT
120 GO TO 50
121
122 C COME HERE TO INTERPRET AN UPPER AIR OBS/REP.
123 C
124 C
125 40 CALL UADINT
126 GO TO 60
127
128 C COME HERE TO PROCESS CLOUD-FOG DATA FROM THE AFSWC 30-NEPH OUTPUT
129 C
130 C
131 50 CALL AFOINT
132 GO DO 65 K=1,44
133 65 CFCOBT(K)=KCBRT(K)
134 IF (SENSE SWITCH 1) 67,68
135 67 CALL FKGOUTINDBWRT,CSEPT,IOBC,KFINO,IOBTAT)
136 68 CONTINUE

```

127
124
126
126
127

CALL BLKOUTINWDBEC,CBSPPT,N08,KFINI,ITATI
LAST=JOB
IF(LAST .EQ. N08) LAST=0
70 RETURN
END

```

CFAT,CFA11(1),INTERT
1 C POINTS INTERPRETED OBS.
2
3 DIMENSION JDAT(44)
4 DATA NCBWY/22/, KFINC/5/, KFIN2/7/, NWOREC/44/
5
6 10 CALL BLKIN(NWOREC,JDAT,1,KFIN2,ICSTAT)
7 NOBJ=JDAT(1)
8 WRITE (6,3000) NOBJ
9 NENDENOB+1
10 DO 155 NNE2,MEND
11 CALL BLKIN(NWOREC,JDAT,NN,KFIN2,ICSTAT)
12 ZROO FORMAT('I',I0X,'NUMBER OF OBSERVATIONS INTERPRETED =',I4,
13 /,
14 IX I2 TIME I02C ITYPE IVALU NTCLC NCEIL
14 *
14 * NVV MINBAS MAXTOP MSPWE LAY1 LAY2 LAY3 LAY4 LAY5 LAY6 LAY7 LAY8
15 * LAY9')
16 IF (MCO(NN,EO) .EQ. 0) WRITE (6,3000) NOO
17 155 WRITE (6,3010) (JDAT(LJM),LJME1,22)
18 3010 FORMAT('3X,IF',IY,15,IX,15,2X,I4,IX,I4,2Y,I2,7X,I2,2X,61IF,IX),IX,91
19 *I4,IX))
20 STOP GOOD
21 END

```

```

CPCAS*CPASS(1),CPSSIM
1 C READS AN INPUT FILE OF INTERPRETED CBS/REP AND SENDS TO THE OUTPUT
2 C FILE THOSE WHOSE OB TIMES WERE .LE. TNEW AND .GE. TOLD.
3
4 INTEGER TNEW,TOLD
5 COMMON /CLOCKI/NCWYIM
6 DIMENSION JDAT(44),INFILE(2),OUTFIL(2)
7 DATA NCBWP/22/, KFINO/5/, KFIN/77/, NWERFC/44/
8
9 MREQ
10 READ (5,1000) TNEW,TOLD,INFILE,OUTFIL
11 NCWYIM=TNEW
12 NNEW
13 CALL BLKIN(INWDREC,JDAT,1,KFINO,ISTAT)
14 NOBJDAT(1)
15 WRITE (6,2000) INFILE,NCB,OUTFIL,TNEW,TOLD
16 WRITE (6,2010) INFILE,OUTFIL
17 NVENN + 1
18 NGENN + 1
19 CALL BLKIN(INWDREC,JDAT,NC,KFIN2,ISTAT)
20 IF (IYMDI(TNEW,JDAT(4)) .LT. 0) GO TO 160
21 IF (IYMDI(JDAT(4),TOLD) .LT. 0) GO TO 160
22 MMEMN+1
23 MTEYM+1
24 CALL BLKOUT(INWDREC,JDAT,MS,KFINO,ISTAT)
25 IF (MOD(MM,5) .EQ. 0) WRITE(6,2010) INFILE,OUTFIL
26 WRITE (6,2020) (JDAT(LJM),LJME1,22)
27 CONTINUE
28 IF (NN .LT. NCB) GO TO 16
29 DO 170 J=1,44
30 JDAT(J)=TNEW
31 JDAT(J)=MM
32 CALL BLKOUT(NWDREC,JDAT,01,KFINO,ISTAT)
33 WRITE (6,2030) INFILE,OUTFIL,MM
34 STOP 6000
35 FORMAT(2I10,10X,2A5,5X,2A8)
36 FORMAT(10Y,INPUT FILE NAME IS ',A8//
37 *10Y,NO. OF INTERPRETED CBS/REP IN THE INPUT FILE =',I6//
38 *10Y,OUTPUT FILE NAME IS ',A8//
39 *10Y,TIME OF MOST RECENT CBS/REP SENT TO THE OUTPUT FILE =',I6//
40 *10Y,TIME OF OLDEST CBS/REP SENT TO THE OUTPUT FILE =',I6)

```

2010 FORMATS (11,10X, LIST OF INTERPRETED OPERATIONS SENT FROM 1,246, 10,
 1,246, 1, IX, 12, TIME 1000 IYVOT IVALU NTCCLC NCCIL
 • NVV MINIBAT MAXTOR MEENE LAY1 LAY2 LAY3 LAY4 LAY5 LAY6 LAY7 LAY8
 • LAY9)
 2020 FORMATS (3X, 15, 1X, 15, 1X, 14, 1X, 13, 1X, 12, 1X, 11, 1X, 9)
 • 14, 1X)
 2030 FORMATS (110X, TOTAL NUMBER OF INTERPRETED OPERATIONS SENT FROM FILE,
 1,246, TO FILE 1,246, WAS 1,75)
 END

41
 42
 43
 44
 45
 46
 47
 48
 49

```

CFAS=CFAS(1),STOENS
1 C READS AN INPUT FILE OF INTERPRETED DBF/REP AND WRITES TO AN OUTPUT
2 C FILE THOSE TAKEN AT STATIONS BELONGING TO A SET OF STATIONS WHICH
3 C CONSTITUTE 3/4, 1/2, 1/4, 1/8, OF 1/16 OF THE FULL STATION DENSITY
4 C OR A SILENT AREA SET.
5 C DIMENSION JDAY(44), INFILE(4), INFILE(2), OUTFIL(2)
6 C INTEGER X
7 C LOGICAL KEEP
8 C DATA NWDREC/44, NINFI/1, NOTFI/2,
9 C MWE0
10 C NN=1
11 C READ (5,1000) ISIDEN, INFILE, INFILE, OUTFIL
12 C STADEN=FCOAY(ISIDEN)/10000.
13 C CALL BLKIN(NWDREC, JDAY, I, NINFI, ISTAT)
14 C NOBJDAY(I)
15 C WRITE (6,2000) INFILE, NOS, OUTFIL, STADEN
16 C NN=NN + 1
17 C CALL BLKIN(NWDREC, JDAY, NN, NINFI, ISTAT)
18 C X = JDAY(I)
19 C KEEP=.FALSE.
20 C IF (ISIDEN .EQ. 7500) GO TO 30
21 C IF (ISIDEN .EQ. 5000) GO TO 40
22 C IF (ISIDEN .EQ. 2500) GO TO 50
23 C IF (ISIDEN .EQ. 1250) GO TO 60
24 C IF (ISIDEN .EQ. 675) GO TO 70
25 C SILENT AREA
26 C IF (X .LE. 2375) KEEP = .TRUE.
27 C GO TO 80
28 C 3/4 DENSITY
29 C 30 CONTINUE
30 C IF (X .EQ. 4503 .OR. Y .EQ. 5371 .OR. X .EQ. 5186 .OR. X .EQ. 3028
31 C +.OR. X .EQ. 3853 .OR. Y .EQ. 4342 .OR. X .EQ. 2288 .OR. X .EQ. -2070
32 C +.OR. X .EQ. 3627 .OR. Y .EQ. 3885 .OR. X .EQ. 3400 .OR. X .EQ. -151
33 C +.OR. X .EQ. 4263 .OR. Y .EQ. 6753 .OR. X .EQ. -1014 .OR. X .EQ. 2192
34 C +.OR. X .EQ. 5082 .OR. Y .EQ. 293 .OR. X .EQ. -736 .OR. X .EQ. 2506
35 C +.OR. X .EQ. 718 .OR. X .EQ. 1415 .OR. X .EQ. -1231 .OR. X .EQ. 1361
36 C +.OR. Y .EQ. 4442 .OR. Y .EQ. 4723 .OR. Y .EQ. 5474) KEEP = .TRUE.
37 C GO TO 30
38 C 1/2 DENSITY
39 C 40 CONTINUE
40 C IF (X .EQ. -151 .OR. X .EQ. 2293 .OR. X .EQ. 5353 .OR. X .EQ. 1415
41 C

```



```

41 +.OR.X .EQ. 3020 .OR. Y .EQ. 1312 .OR. X .EQ. 3885 .OR. X .EQ. 2506
42 +.OR.X .EQ. 6186 .OR. X .EQ. 1400 .OR. X .EQ. 4442 .OR. X .EQ. -1231
43 +.OR.X .EQ. 1293 .OR. X .EQ. 2192 .OR. X .EQ. 4342 .OR. X .EQ. -1314
44 +.OR.X .EQ. 3853 .OR. X .EQ. -2070 .OR. X .EQ. 6046) KEEP = .TRUE.
45 GO TO 80
46 1/4 DENSITY
47 50 CONTINUE
48 IF (X .EQ. 2238 .OR. Y .EQ. 2506 .OR. X .EQ. 3400 .OR. X .EQ. 293
49 +.OR.X .EQ. 2192 .OR. X .EQ. 4342 .OR. X .EQ. -1014 .OR. X .EQ. 3853
50 +.OR.X .EQ. -2070 .OR. X .EQ. 6046) KEEP = .TRUE.
51 GO TO 80
52 1/8 DENSITY
53 60 CONTINUE
54 IF (X .EQ. 2506 .OR. Y .EQ. 2192 .OR. X .EQ. 4342 .OR. X .EQ. 4342 .OR.
55 + X .EQ. -1014 .OR. X .EQ. 3853) KEEP = .TRUE.
56 GO TO 80
57 1/16 DENSITY
58 70 CONTINUE
59 IF (X .EQ. 4342 .OR. Y .EQ. -1014) KEEP = .TRUE.
60 CONTINUE
61 IF (KEEP) GO TO 90
62 IF (NN.LT. N08) GO TO 15
63 GO TO 165
64 MMEMM+1
65 MCEMM+1
66 CALL BLKOUT(INWDREC,JDAT,MS,NOTFI,ISTAT)
67 IF (MOD(NM,50) .EQ. 1) WRITE(6,2010) INFILE,OUTFIL
68 WRITE (6,2020) (JDAT(LJM),LJME1,22)
69 CONTINUE
70 IF (NN.LT. N08) GO TO 15
71 165 CONTINUE
72 DO 170 I=1,44
73 JDAT(I)= -32768
74 JDAT(1)=MM
75 CALL BLKOUT(INWDREC,JDAT,01,NOTFI,ISTAT)
76 WRITE (6,2030) INFILE,OUTFIL,MM
77 STOP GOON
78 1000 FORMAT(I10,IUX,2A6,8X,2A6)
79 2000 FORMAT(10X,'INPUT FILE NAME IS ',2A6//
80 *10X,'NO. OF INTERPRETED 095/SEP IN THE INPUT FILE =',I6//
81 *10X,'OUTPUT FILE NAME IS ',2A6//

```

82 *10X, STATION DENSITY IN OUTPUT FILE = ,F5.3)
 83 2010 FORMAT(1,10X,LIST OF INTERPRETED OBS/RFP SENT FROM ,2A6, TO ,
 84 *2AS / , IX IY IZ TIME IORC I'YPE IVALU NTCLC NCEIL
 85 * NVV MINBAS MAXTOP MSPWE LAY1 LAY2 LAY3 LAY4 LAY5 LAY6 LAY7 LAY8
 86 * LAY9,)
 87 2020 FORMAT(3X,I5,I5,1X,I5,2X,I4,1X,I4,2X,I3,3X,I2,2X,6(I6,1X),1X,9(
 88 *I4,1X))
 89 2030 FORMAT(/10X, TOTAL NUMBER OF INTERPRETED OBS/REP SENT FROM FILE ,
 90 *2A6, TO FILE ,2A6, WAS ,I5)
 91 END

```

CFAS,CFASS(1),CFMAIN,IJFL
1 C READS IN INTERPRETED OBS FROM A FILE, PRINTS OUT AND STORES THEM
2 VIA STOREC.
3
4 INTEGER TASK
5 COMMON /CLOCKT/NOHTYM,LASTSK
6 DIMENSION JDAT(44),F1(4),F2(7),I1(13)
7 DATA NOBRT/22/, KFINO/5/, KFIN2/7/, NWDREC/44/
8
9 JOBCY=0
10
11 LAST=0
12 NPRINT=0
13 LASTSK = 0
14 5 READ (5,1000) TASK,NPRT,NOHTYM
15 FORMAT(3I10)
16 WRITE (6,2000) TASK,NPRT,NOHTYM
17 FORMAT(1,5X,1TASK,14,5X,NPRT,14,5X,NOHTYM,15)
18 GO TO (16,10,20,200),TASK
19 10 CALL BLKIN(NWDREC,JDAT,1,KFIN2,ISTAT)
20 NOB=JDAT(1)
21 NENDENOB+1
22 DO 30 NN=2,NEND
23 CALL BLKIN(NWDREC,JDAT,NN,KFIN2,ISTAT)
24 IF (NN.GT. 2) GO TO 20
25 IF (LASTSK.EQ. 0 .AND. TASK.EQ. 2) LASTSK=3
26 CALL EXEC1(TASK,TIME,JDAT,F1,LAST,TYMOLD,F2,I1,JOBCY)
27 LASTSK=2
28 CONTINUE
29 LASTSK=TASK
30 TASK=
31 IF (SENSE SWITCH 1) 150,150
32 CONTINUE
33 WRITE (5,2000) JOBCY
34 FORMAT(1,10X,NUMBER OF INTERPRETED OBS/PERS INPUT F,10,
35 /, IY IY I7 TIME I09C I7YPE IVALU NTCCL NCBIL
36 * NVV MINPER MAXTOP MSPWE LAY1 LAY2 LAY3 LAY4 LAY5 LAY6 LAY7 LAY8
37 * LAY9*)
38 DO 155 JMC=1,JOBCY
39 IF (MOC(JMC,50).EQ. 0) WRITE (5,3000) JOBCY
40 CALL BLKIN(NCPRT,JDAT,JMC,KFINO,ISTAT)

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41 155 WRITE (6,3010) (JDAY(LJM),LJME1,22)
42 2010 FORMAT(3X,IF,1X,15,1X,15,2X,14,1X,14,2X,17,3X,12,2X,(16,1X),1X,91
43      *14,1X))
44 160 CONTINUE
45 CALL EXECI(TASK,TIME,JDAY,FI,LAST,TYMOLD,F2,I1,JOBCT)
46 LASTSK=TASK
47 GO TO 5
48 200 CONTINUE
49 STOP GOOD
50 END
CFAS=CFASD(1),EXECI/IJFL
1 SUBROUTINE EXECI(TASK,TIME,OBSPRP,FI,LAST,TYMOLD,F2,I1,NCP)
2
3 C INPUT DATA (FORMAL PARAMETERS)
4
5 C TASK = TASK REQUESTED BY EPAMS
6 C 1 = SET UP THE OBS/REP STORAGE FILES
7 C 2 = INPUT OBS/REP
8 C 3 = CREATE A NEW CFDR
9 C 4 = UPDATE THE LATEST CFDR ON FILE
10 C 5 = OUTPUT UPDATED COMMON BLOCK BASE TO MASS STORAGE
11 C TIME = REFERENCE TIME OF CFDR CREATION OR UPDATE
12 C OBSPRP = OBS/REP
13 C LAST = SEQUENCE NUMBER OF THE LAST OBS/REP STORED.
14 C TYMOLD = TIME OF OLDEST OBS/REP TO BE USED IN A CREATION OR UPDATE
15 C DATA STATEMENTS
16 C
17 C LOGFILE = LOGICAL DEVICE NO. OF TEMPORARY STORAGE FILE USED IN
18 C *COMMON*.
19 C NCBAR = MAXIMUM NUMBER OF OBS/REP THAT CAN BE USED IN A CREATION
20 C OR UPDATE.
21 C
22 C OBS/REP INPUT ELEMENTS
23 C
24 C IX = X DISTANCE OF OBS/REP SITE FROM TXREF, HECTOMETERS.
25 C IY = Y DISTANCE OF OBS/REP SITE FROM TYREF, HECTOMETERS.
26 C IZ = OBS/REP SITE ELEVATION ABOVE MEAN SEA LEVEL, METERS.
27 C ITIME = TIME OF OBS/REP (0-1440)
28 C ITYPE = TYPE OF OBS/REP
29 C

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30 C 1 = ALWAYS, -1 IS A SPECIAL.
 31 C 2 = METAR, -2 IS A SPECIAL (PREFIX)
 32 C 3 = SYNOP
 33 C 4 = UPPER AIR (RAOB), -4 IS A SPECIAL
 34 C 5 = AFSWC TO-NERH OUTPUT
 35 C FOR EXPLANATION OF REMAINING OBSERVED INPUT ELEMENTS CONSULT
 36 C LISTINGS OF SUBROUTINE SFOINT IF A SURFACE OBS/REP OR
 37 C SUBROUTINE UADINT IF AN UPPER AIR OBS/REP.
 38 C
 39 C CFOR PARAMETERS DETERMINED FROM OBS/REP.
 40 C
 41 C TCBC = SEQUENCE NO. OF OBS/REP.
 42 C TVALU = CFOR INFORMATION VALUE OF THE OBS/REP
 43 C NYCLC = TOTAL CLOUD COVER, (00 TO 100)
 44 C NCEIL = HEIGHT OF CEILING LAYER (AGL), DEKAMETERS. MINUS IF A
 45 C VARIABLE CEILING. LAST DIGIT OF NCEIL INDICATES THE
 46 C METHOD BY WHICH THE CEILING WAS DETERMINED.
 47 C 1 = MEASURED
 48 C 2 = AIRCRAFT
 49 C 3 = BALLOON
 50 C 4 = RADAR
 51 C 5 = ESTIMATED
 52 C 6 = INDEFINITE
 53 C MWV = PREVAILING SURFACE VISIBILITY, METERS. MINUS IF VARIABLE.
 54 C MINBAS = HEIGHT OF BASE OF LOWEST CLOUD, DEKAMETERS.
 55 C MAXTOP = HEIGHT OF TOP OF HIGHEST CLOUD THAT COULD BE DETERMINED
 56 C FROM OBS/REP ELEMENTS, DEKAMETERS.
 57 C MSPWE = MOST SIGNIFICANT PRESENT WEATHER ELEMENT. (NWS CODE 4577)
 58 C LCOV(I) = PERCENT CLOUD COVER IN THE CFOR LAYERS, (00 TO 100).
 59 C
 60 C CFOR LAYERS
 61 C LAYER BOTTOM FEET 0 METERS 150 FEET 45 METERS
 62 C 1 150 45 91
 63 C 2 300 91 183
 64 C 3 600 183 305
 65 C 4 1000 305 610
 66 C 5 2000 610 1057
 67 C 6 4000 1057 1524
 68 C 7 8000 1524 1981
 69 C 8 16000 1981 3048
 70 C 9 32000 3048


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71 INTEGER TASK, TIME, OBSRPT, TYPOLD
72
73 COMMON /CLOCKT/NOHTYM, LASTSK
74 COMMON /OBSRPT/IX, IV, IZ, ITIME, IOBC, ITYPE, IVALU, NYCLC, NCEIL, NVV,
75 *MINBAS, MAXTOP, MSPWE, LCOV(9), ICL, ITCC, ICM, TCH, ICTS(10), NWEA(7), IOM,
76 *NOUSE(99)
77 DIMENSION OBSRPT(143), KOPR(143), F1(4), F2(7), I1(17)
78 INCLUDE BASE, LIST
79
80 EQUIVALENCE (KOPR(1), IX)
81
82 DATA LFILE/3/, NOBR/100/
83 DATA KNUMBER /0/
84 DATA IPRT/6/
85 DATA NOBRPT/22/, KFINO/5/
86 DATA MISS/-32768/
87
88 GO TO (2, 2, 70, 70, 25), TASK
89
90 2 IF (LASTSK .LE. 2) GO TO 5
91
92 C RETRIEVE THE CONTENTS OF COMMON /BASE/ FROM MASS STORAGE.
93
94 CALL BLKIN(KWOPR, OBJECT, I, KNUMBER, KSTATI)
95 WRITE (6, 7000) NINI, IPLOCK, NBJUNK, INUMPR, IS'ATI, ISY'ATO, JNUMBER, JSTA
96 *II, JSTATO, JTIME, LASTJ
97
98 5 CONTINUE
99
100 GO TO (10, 20, 70, 70), TASK
101
102 C COME HERE TO INITIALIZE AND SET UP OBSRPT STORAGE FILES
103
104 10 CALL BEGIN
105 FORCED
106 RETURN
107
108 20 TORCELAST + 1
109 NOBENOP+1
110 75 (SENSE SWITCH 1) 67, 68
111 87 CALL BLKOUT(NOBRPT, OBSRPT, NOB, KFINO, I'ITAT)
112 88 CONTINUE
113 89 CALL STORE(OBSRPT)

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112 LAST=IOBC
113 IF(LAST .EQ. NOBP) LAST=0
114 RETURN
115 C STORE THE CONTENTS OF COMMON /BASE/ ON MASS STORAGE.
116
117 125 CALL BLKOUT(KWORDS,DXSECT,I,KNUMBER,KSTATI)
118 WRITE (6,3010) NINI,IBLOCK,NBJNOW,INUM ,JSTATI,ISTATO,JNUMBER,JSTA
119 *I,JSTATO,JTIME,LASTJ
120
121 130 RETURN
122 3000 FORMAT(' CONTENTS OF COMMON /BASE/ HAS BEEN READ IN FROM MASS STOR
123 *AGE- ',NINI=' ',I7', IELOCK=' ',I7', NBJNOW=' ',I7', INUMBR=' ',I7',
124 *ISTATI=' ',I7', ISTATO=' ',I7', JNUMBER=' ',I7', JSTATI=' ',I7', JSTATO
125 *=' ',I7', JTIME=' ',I7', LASTJ=' ',I7'////)
126 3010 FORMAT(' CONTENTS OF COMMON /BASE/ HAS BEEN OUTPUT TO MASS STORAGE
127 *- ',NINI=' ',I7', IPLOCK=' ',I7', NBJNOW=' ',I7', INUMBR=' ',I7', IST
128 *ATI=' ',I7', ISTATO=' ',I7', JNUMBER=' ',I7', JSTATI=' ',I7', JSTATO=' ',
129 *I7', JTIME=' ',I7', LASTJ=' ',I7'////)
130 END

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CFASD,CFASS(1),CFEMAIN/TASK3R1
1 C
2 CFMAIN
3 TEST DRIVER FOR THE CFAS
4 INTEGRO TASK, TIME, TMMOLD, CFASD, GRDPRV, GRD
5 COMMON /TDA/ JX, JY, JZ, ITIME, IOBC, ITYPE, IVALU, NTCLC, NCEIL, NVV,
6 *MINRAC, MAXTOP, MCPWF, LCOV(9), ICL, ITSC, ICM, ICH, ICTS(10), MWEA(7), IPH,
7 *IKO, IHS, ICFE, IYI, IYO, IVIS, NH, IH, NS(10), IME(10), IYHN(10), ICLG, TICLGV
8 *IVISC, NCDSE(58)
9 COMMON /CLOCKY/NOWTYM, LACTSK
10 COMMON /MAP/ XREF, YREF, CMDP
11 COMMON /OUTPUT/IBEG, IEND, JREG, JEND
12
13 DIMENSION IDAT(143), JOAT(143), IZ(30), IP(30), IT(30), IDO(30), OIST(3)
14 *TYMC(3), ISSQ(5), CFASD(6010), GRDPRV(20,20,15), IDENT(10), Z(30), P(30)
15 *T(30), DD(30)
16 EQUIVALENCE (IDAT(1), JX), (JOAT(22), ICL, IZ(1)), (JOAT(53), NS(1)), IP(1)
17 *), (IDAT(23), ICLG, IT(1)), (IDAT(113), IPO(1)), (IDAT(143), N99L),
18 * (CFASD(11), GRDPRV(1,1,1)), (CFASD(1), IDENT(1))
19 DATA MISS/-32768/
20 DATA NCFE/4/
21 DATA GRD/25/, LNTHX/500/, LNTHY/500/
22 DATA YZRO/164.66/, YZRC/3399.56/, CNTMEP/85.5/
23 DATA NCDWRT/22/, KFINC/5/
24
25 LACTED
26 NPPTED
27 LASTSK = 0
28 XREFEY7R0
29 YREFEY7R0
30 CMDDECNTM7R
31 IGPFLNTHX/020
32 JGPFLNTHY/620
33 ICFDR=IGP*JGP*15+10
34 S READ (5,1000) TASK, NPPT, NOWTYM
35 FORMAT(8I10)
36 WRITE (6,7000) TASK, NPPT, NOWTYM
37 MFCG:
38 FORMAT(1I,5X,14CKE,14,5X, NPPT=,14,5X, NCDWRTM=,15)
39 GO TO (170,10,200,200), TASK
40 10 00 00 151,143

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41 20 1000(Y)EMITS
42 READ (5,1000,END=140) JX,JY,JZ,ITIME,ITYPE,IVIS,NC
43 MFCIARS(ITYPE/10)
44 ITYPE=MOD(ITYPE,10)
45 MFCIARS(ITYPE)
46 GO TO (30,20,30,80,100),MT
47 IF(NPRT .EQ. 0) GO TO 33
48 WRITE (6,2005)
49 FORMAT(7)
50 WRITE (6,2010)JX,JY,JZ,ITIME,ITYPE,IVIS,NC
51 FORMAT(4X,JY,8X,JY,8X,JZ,6X,ITIME,5X,ITYPE,6X,IVIS,6X,
52 ,NC,7(2X,I6,2X)/)
53 GO TO (35,50,40,90,100),MT
54 IF READ (5,1000) ICLG,ICLGV,IVISC
55 IF(NPRT .EQ. 0) GO TO 50
56 WRITE (6,2020) ICLG,ICLGV,IVISC
57 FORMAT(3X,ICL6,5X,ICLGV,5X,IVISC/3(7X,I6,2X)/)
58 GO TO 50
59 40 READ (5,1000) ITSC,NH,ICL,I4,ICM,ICH,IPW
60 IF(NPRT .EQ. 0) GO TO 50
61 WRITE(6,2030) ITSC,NH,ICL,I4,ICM,ICH,IPW
62 2030 FORMAT(3X,ITSC,7X,NH,7X,ICL,8X,I4,7X,ICM,7X,ICH,7X,IP
63 ,W,7(2X,I5,2X)/)
64 50 READ (5,1000) (NWEA(I),I=1,7)
65 IF(NPRT .EQ. 0) GO TO 55
66 WRITE (6,2035) (NWEA(I),I=1,7)
67 FORMAT(2X,NWEA(1),2X,NWEA(2),3X,NWEA(3),3X,NWEA(4),3X,NWE
68 ,A(5),3X,NWEA(6),3X,NWEA(7)/7(2X,I4,3X)/)
69 IF(NC .EQ. 0) GO TO 110
70 READ (5,1010) (NS(I),I=1,7),IHS(I),ITHN(I),I=1,NC)
71 FORMAT(4I10)
72 IF(NPRT .EQ. 0) GO TO 110
73 WRITE(6,2040)
74 FORMAT(4X,NS,9X,ICTS,8X,IHS,9X,ITHN,7)
75 WRITE(6,2050) (NS(I),I=1,7),IHS(I),ITHN(I),I=1,NC)
76 FORMAT(4(2X,I6,4X))
77 GO TO 110
78 IF(NPRT .EQ. 0) GO TO 85
79 WRITE (6,2065)
80 WRITE (6,2060) JX,JY,JZ,ITIME,ITYPE
81 FORMAT(4X,JX,8X,JY,8X,JZ,6X,ITIME,5X,ITYPE/5(2X,I6,2X)/)

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82 ZEQ
83
84 READ (5,1000) IZ(I),IP(I),IY(I),IDD(Y)
85 I(I)=FLOAY(IZ(I))
86 I(I)=IY(I)+2732
87 P(I)=FLOAY(IP(I))*1
88 P(I)=A25(P(I))
89 Y(I)=FLOAY(IY(I))*1
90 DD(I)=FLOAY(IDD(I))*1
91 IF(IP(I) .GE. 0) .OR. (IP(I) .EQ. MISS) GO TO 90
92 NBRLEI
93 IF(NPRT .EQ. 0) GO TO 110
94 WRITE (6,2070)
95
96 FORMAT(2X,'IY',10X,'IP',10X,'IY',10X,'IDD',10X,'P',11Y,'Y',
97 'IX',100//)
98 WRITE(6,2080) (IZ(I),IP(I),IY(I),IDD(I),Z(I),Y(I),DD(I),Y(I),
99 'NBRLEI)
100 FORMAT(3X,4Y12,4F12.2)
101 GO TO 110
102 IF(NPRT .EQ. 0) GO TO 105
103 WRITE (6,2005)
104 WRITE (6,2060) JX,JY,JZ,IYIME,IYME
105 READ (5,1000) N1CLC,NCEIL,NVV,MINBAS,MAXTOP,MSPNF,LCOV(I),I=1,9)
106 IF(NPRT .EQ. 0) GO TO 110
107 WRITE (6,2090) N1CLC,NCEIL,NVV,MINBAS,MAXTOP,MSPNF,LCOV(I),I=1,9)
108 FORMAT(3X,'N1CLC',5X,'NCEIL',5X,'NVV',5X,'MINBAS',4X,'MAXTOP',4X,'
109 'MSPNF',4X,'LCOV(1)',3X,'LCOV(2)',8(2X,'I6,2Y')/2X,'LCOV(3)',3X,'LCO
110 V(4)',3X,'LCOV(5)',3X,'LCOV(6)',3X,'LCOV(7)',7X,'LCOV(8)',3X,'LCOV
111 '(8)',7(2X,'I6,2X')//)
112 GO TO 120 J=1,147
113 J=1,147
114 IF (LASTASK .EQ. 0 .AND. TASK .EQ. 0) LASTASK=7
115 CALL CEXEC(TASK,TIME,JOAT,X0,Y0,XLN,MLN,LECT,IVMCLD,CSP,DTST,TYMC
116 'ICCG,NCCO,NBKOUT,IDENT)
117 LASTASK=7
118 IF (MFG .LE. 9) GO TO 10
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123      / , IX      IY      IZ      ITIME      I030      I'Y80      IVALU      MCOL0      MCOLL
124      * MVA      MINFAC      MAXTOP      MSCALE      LAY1      LAY2      LAY3      LAY4      LAY5      LAY6      LAY7      LAY8
125      * LAY9 )
126      DO 155 JMODE1, LAST
127      TE (M00(JM0,00) ,00, 0) WRITE (6,3000)
128      CALL ELKIN(INCWRM1,JOAT,JMC,KFINO,ISTAR)
129      WRITE (6,3010) (JOAT(LJM),LJME1,00)
130      FORMAT(3X,I2,I1X,I5,I1X,I5,2X,I4,I1X,I4,2X,I3,3X,I2,2X,I6(I6,I1X),I1X,9(
131      *I4,I1X))
132      160 CONTINUE
133      CALL CFXEXEC(TASK,TIME,JOAT,X0,Y0,XLN,YLN, LAST, TYMOLD, DSP, DIST, TYMC
134      * ISSO, NISSO, NBKOUT, IDENT)
135      GO TO 5
136      200 READ (5,1000) NBKOUT & INPUT LAST RECORD NUMBER ON CFDE
137      WRITE (6,2049) NBKOUT
138      FORMAT (I1X,NBKOUT = ,I5)
139      READ (5,1000) TIME,TYMOLD,NISSO,(ISSO(I),I=1,NISSO)
140      WRITE (6,2100) TIME,TYMOLD,NISSO,(ISSO(I),I=1,NISSO)
141      FORMAT(73X,TIME,5X,TYMOLD,5X,NISSO,4X,I559(I),,7X,,ISSO(I2),,
142      *2X,,ISSO(7),,2X,,ISSO(4),,8I2X,I6,2X)/)
143      READ (5,1020) DSP,(DIS(I),I=1,7),TYMC(I),I=1,3)
144      FORMAT(8F10,1)
145      WRITE (6,2110) DSP,(DIS(I),I=1,3),TYMC(I),I=1,3)
146      FORMAT(75X,DSP,5X,DIST(1),,5X,,DIST(2),,5X,,DIST(3),,5X,,TYMC(1
147      *),,5X,,TYMC(2),,5X,,TYMC(3),/7(2X,F8.1,2X)/)
148      IF (TASK .EQ. 7) GO TO 200
149      READ (5,1030) X0,Y0,XLN,YLN
150      WRITE (6,2120) X0,Y0,XLN,YLN
151      FORMAT(75X,X0,,10X,Y0,,10X,YLN,,10X,YLN,/4I2X,F9.1,2X))
152      250 NBKOUT=NBKOUT+1
153      IF (LASTX .EQ. 0) LASTX = 3
154      READ (5,2180) IDENT
155      FORMAT(10A5)
156      CALL CFXEXEC(TASK,TIME,JOAT,X0,Y0,XLN,YLN, LAST, TYMOLD, DSP, DIST, TYMC
157      * ISSO, NISSO, NBKOUT, IDENT)
158      STOP 0000
159      END
160 CFX01/CFX01
161      SUBROUTINE EXEC(TASK,TIME,C0PT01,F1, LAST, TYMOLD, DSP, IN, N00)
162      INTEGER TASK, TIME, C0SP01, TYMOLD

```



```

4 COMMON /CLOCKT/NOWTYM,LASTCK
5 COMMON /DRESER/IX,IY,IZ,ITIME,IOBC,ITYOC,YVALU,NICLC,NCEIL,NVV,
6 *MINBAC,MAYTOP,MSPWE,LCOV(9),ICL,ITSC,TCM,YCH,ICTS(10),NWER(7),IPW,
7 *NOCSE(99)
8 DIMENSION INGBEL(44),F(14),F2(7),I(17)
9 INCLUDE BASE,LIST
10
11
12 DATA LFILE/3/,NCRP/100/
13 DATA KNUMBER /0/
14 DATA IPRY/6/
15 DATA NORWRT/22/,KFINC/5/
16 DATA MISS/-32768/
17
18 GO TO (2,2,70,70,125),TASK
19 2 IF (LASTCK .LE. 2) GO TO 5
20
21 C RETRIEVE THE CONTENTS OF COMMON /BASE/ FROM MASS STORAGE.
22
23 CALL RLKIN(KWORDS,OBJECT,1,KNUMBER,KTSTATI)
24 WRITE (6,3000) NINI,IPBLOCK,NEJNOW,INUMBR,ICTATI,ICTATC,JNUMBER,JSTA
25 *TI,JUSTATO,JTIME,LASTJ
26
27 5 CONTINUE
28 GO TO (10,20,70,70),TASK
29
30 RETURN
31
32 IF (LASTCK .LE. 2) GO TO 80
33
34 C RETRIEVE THE CONTENTS OF COMMON /PAGE/ FROM MASS STORAGE.
35
36 CALL RLKIN(KWORDS,OBJECT,1,KNUMBER,KTSTATI)
37 WRITE (6,3000) NINI,IPBLOCK,NBJNOW,INUMBR,CTSTATI,ICTATC,JNUMBER,JSTA
38 *TI,JUSTATO,JTIME,LASTJ
39
40 80 INCODE=1
41
42 C INSURE THAT TMOLE IS NOT MORE THAN 1680 MINUTES (14 HOURS) PRIOR
43 TO TIME. RESET TMOLE TO TIME-1020 IF NECESSARY.
44

```



```

45 YDIF=TYMDF(TIME, TYMOLD)
46 YF(IDIF .GT. 0) GO TO 90
47
48 RETURN IF TYMOLD IS MORE THAN 24 HOURS PRIOR TO TIME
49
50 WRITE(IPRT, 1990) TYMOLD, TIME
51 FORMAT( TYMOLD, 'IS', IS EITHER MORE THAN 24 HOURS PRIOR TO TIME,
52 'IF', OR IF MORE RECENT THAN TIME, 'TA' TASK CANNOT BE COMPLETED WI
53 'TH THIS AMPLITUDE, '//)
54 IF(IDIF .LE. 1080) GO TO 100
55 TYMOLD=TIME-1080
56 IF(TYMOLD .LT. 0) TYMOLD=1440+TYMOLD
57
58 WRITE(IPRT, 2000) YDIF, TYMOLD
59
60 FORMAT( TIME DIFFERENCE BETWEEN REFERENCE TIME AND TIME OF OLDEST
61 ' USEABLE OBS/REP = ', I3, ' MINUTES, ', TIME OF OLDEST USEABLE OBS/RE
62 'P RESET TO ', I4, ' MINUTES WHICH IS 1080 MINUTES PRIOR TO REFERENCE
63 ' TIME, '//)
64
65 RETRIEVE OBS/REP IN REVERSED CHRONOLOGICAL ORDER FROM TIME TO
66 TYMOLD
67
68 CALL RESTOR(INCODE, TIME, INOREL, NOMORE, TYMOLD)
69 INCODE=2
70 IF (INOREL(9) .EQ. 32000) INOREL(9)=MINCS
71
72 JUMP TO 120 IF THERE ARE NO MORE OBS/REP IN THE DATA BASE.
73
74 IF(NOMORE .EQ. 1) GO TO 120
75 NOMORE=1
76 CALL BLKOUT(23, INOREL, NOR, LOG, LOG, LOG)
77
78 JUMP BACK TO 100 AND ATTEMPT TO RETRIEVE ANOTHER OBS/REP IF THE
79 MAXIMUM USEABLE NUMBER HAS NOT BEEN REACHED.
80
81 IF(NICE .LT. NOBP) GO TO 100
82 CONTINUE
83 IF(LASTSK .GT. 2) GO TO 130
84
85 STORE THE CONTENTS OF COMMON /RECV/ ON MASS STORAGE.

```

```

86 12F CALL PLKOUT(WORDS,DYCECT,I,KUMPP,KSTATI)
87 WRITE (6,7010) NINI,IBLOCK,NBJUNK,INUMBR,ISTATI,ITAT0,JNUMBER,JSTA
88 ,I,JSTAT0,ITIME,LASTJ
89
90 130 RETURN
91
92 3000 FORMAT( CONTENTS OF COMMON /BASE/ HAS BEEN READ IN FROM MASS STOR
93 *AGE- // NINI =,I7/, IBLOCK =,I7/, NBJUNK=,I7/, INUMBR =,I7/,
94 *STATI =,I7/, ISTAT0 =,I7/, JNUMBER =,I7/, JSTATI =,I7/, JSTAT0
95 * =,I7/, JTIME =,I7/, LASTJ =,I7// //)
96 3010 FORMAT( CONTENTS OF COMMON /BASE/ HAS BEEN OUTPUT TO MASS STORAGE
97 * // NINI =,I7/, IBLOCK =,I7/, NBJUNK =,I7/, INUMBR =,I7/, IST
98 *ATI =,I7/, ISTAT0 =,I7/, JNUMBER =,I7/, JSTATI =,I7/, JSTAT0 =,
99 *I7/, JTIME =,I7/, LASTJ =,I7// //)
100 END
101
102 CFAC*CFAC(1),EXFC2/*SKZRI
103
104 1 SUBROUTINE FVSC2(TASK,TIME,CBPRPT,X0,Y0,XL,N,YLN,LAST,SYMOLD,OSP,
105 *DIST,SYM0,ISS0,NCSC,NBKOUT,TOENT,N0B)
106 DIMENSION INOBS(23,100)
107 DATA LSFILF/3/
108 DO 70 I=1,N0B
109 CALL BLKIN(I2,INCS(I,I),I,LSFILF,ISTAT)
110 WRITE (6,3000) N0B
111 DO 90 I=1,N0B
112 IF (MOD(I,50) .EQ. 0) WRITE (6,3000) N0B
113 WRITE (6,7010) (INOB(I,J),J=1,22)
114 CONTINUE
115 RETURN
116
117 3000 FORMAT('1',10X,'NUMBER OF OBSERVATIONS RETRIEVED FOR ANALYSIS =',
118 * I4, /, ' IY IZ TIME IOPC IYPE IVALU NTCCL NCCIL
119 * NNV MINRAC MAXTOP MSPWE LAY1 LAY2 LAY3 LAY4 LAY5 LAY6 LAY7 LAY8
120 * LAYS')
121 3010 FORMAT('3X,I7,I8,I9,I10,I11,I12,I13,I14,I15,I16,I17,I18,I19,I20,I21,I22,
122 *I4,I1X)
123 END

```

```

CGRAD*CFRACS(1),CESTAT
1  INTEGER WORDS,UNIT,FIRST,LAST,STATUS,BLOCK,HOLD,TRUTH,ANLYZD,HOLDI
2  *,BKNOCT
3  DIMENSION TRUTH(20,20,15),ANLYZD(20,20,15),HOLD(6010),HOLDI(6010)
4  EQUIVALENCE (HOLD(11),TRUTH(1,1,1)),(HOLD(11),ANLYZD(1,1,1))
5
6  ** THIS PROGRAM TAKES DATA IN BLOCKS AND DOES STATISTICAL
7  ** ANALYSIS FOR THE SKY COVER, CEILING, VISIBILITY AND
8  ** PRESENT WEATHER.
9
10 ** WORDS = THE NUMBER OF WORDS PER BLOCK
11 ** TRUTH = THE GROUND TRUTH DATA SET
12 ** ANLYZD = THE CURRENT DATA SET MEASURED AGAINST TRUTH
13 ** BKNOCT = BLOCK NO. OF GROUND TRUTH DATA SET.
14
15 WORDS = 6010
16 UNIT = 14
17 BKNOCT = 1
18
19 WRITE (6,10)
20 FORMAT (1X,'WHAT IS THE FIRST AND LAST BLOCK YOU WANT ANALYZED?')
21 READ (5,20) FIRST,LAST
22 WRITE (5,20) FIRST,LAST
23
24 CALL BLKIN (WORDS,HOLD,BKNOCT,UNIT,STATUS)
25 DO 30 BLOCK = FIRST,LAST
26   PRINT 40,BLOCK
27   CALL BLKIN (WORDS,HOLDI,BLOCK,UNIT,STATUS)
28   CALL COVER (TRUTH,ANLYZD)
29   CALL CEILING (TRUTH,ANLYZD)
30   CALL VISIBL (TRUTH,ANLYZD)
31   CALL WEATHR (TRUTH,ANLYZD)
32   CALL LAYERS (TRUTH,ANLYZD)
33 CONTINUE
34
35 FORMAT ('1',STATACK OUTPUT FOR BLOCK ',I2)
36 STOP NORMAL
37 END

```

```

CEAS=CCLASS(I),CEILING
1  SUBROUTINE CEILING (I,TRUTH,ANLYZD)
2  INTEGER CEILING,DATNUM,TRUTH,ANLYZD,MISSNG
3  REAL DATA,NBRMIS
4  DIMENSION TRUTH(20,20,15),ANLYZD(20,20,15),DATA(400,2)
5
6  MISSNG = -32768
7  DATNUM = 0
8  NBRMIS = 0.
9  CEILING = 0
10
11 DO 20 I = 1,20
12   DO 15 J = 1,20
13    IF (ANLYZD(I,J,CEILING) .EQ. MISSNG) GO TO 10
14    DATNUM = DATNUM + 1
15    DATA(DATNUM,1) = FLOAT(TRUTH(I,J,CEILING))
16    DATA(DATNUM,2) = FLOAT(ANLYZD(I,J,CEILING))
17    GO TO 15
18
19  NBRMIS = NBRMIS + 1.
20  CONTINUE
21 CONTINUE
22
23 PRINT 30,NBRMIS,DATNUM
24 FORMAT (1X,'OUT OF A POSSIBLE 400 VALUES',F4,' WERE MISSING AND',
25         '14,' WERE VALID CEILINGS.')
26 CALL STATPK (DATA,DATNUM)
27 RETURN
28 END

```

```

CFAS*CFASS(0),COVER
1  SUBROUTINE COVER (TRUTH,ANYLZD)
2  INTEGER SKYCOV,DATNUM,TRUTH,ANYLZD,MISSNG
3  REAL DATA,NBRMIS
4  DIMENSION TRUTH(20,20,15),ANYLZD(20,20,15),DATA(400,2)
5
6  MISSNG = -32768
7  DATNUM = 0
8  NBRMIS = 0.
9  SKYCOV = 1
10
11  DO 20 I = 1,20
12    DO 15 J = 1,20
13      IF (ANYLZD(I,J,SKYCOV) .EQ. MISSNG) GOTO 10
14      DATNUM = DATNUM + 1
15      DATA(DATNUM,1) = FLOAT(TRUTH(I,J,SKYCOV))
16      DATA(DATNUM,2) = FLOAT(ANYLZD(I,J,SKYCOV))
17      GOTO 15
18
19    NBRMIS = NBRMIS + 1.
20    CONTINUE
21  CONTINUE
22
23  PRINT 30,NBRMIS,DATNUM
24  FORMAT (1X,'OUT OF A POSSIBLE 400 VALUES',F4,' WERE MISSING AND',
25  *      'IN', ' WERE VALID SKY COVERS')
26  CALL STATPK (DATA,DATNUM)
27  RETURN
28  END

```

```

CFAS*CFASS(0),LAYERS
1  SUBROUTINE LAYERS (TRUTH,ANYLTD)
2  INTEGER LAYER,DATNUM,TRUTH,ANYLDT,MISING,NBRMIS
3  REAL DATA
4  DIMENSION TRUTH(20,20,15),ANYLZD(20,20,15),DATA(400,2)
5
6  MISING = -32768
7
8  DO 40 LAYER = 7,15
9    DATNUM = 0
10   NBRMIS = 0
11   DO 30 I = 1,20
12     DO 20 J = 1,20
13       IF (ANYLZD(I,J,LAYER) .EQ. MISING) GOTO 10
14       DATNUM = DATNUM + 1
15       DATA(DATNUM,1) = FLOAT(TRUTH(I,J,LAYER))
16       DATA(DATNUM,2) = FLOAT(ANYLZD(I,J,LAYER))
17       GOTO 20
18
19       NBRMIS = NBRMIS + 1
20     CONTINUE
21   CONTINUE
22   L = LAYER - 6
23   PRINT 50,NBRMIS,DATNUM,L
24   CALL STATPK (DATA,DATNUM)
25 CONTINUE
26
27 * 50 FORMAT (1X,'OUT OF A POSSIBLE 400 VALUES',I4,' WERE MISSING AND',
28 + I4,' WERE VALID LAYERS FOR LAYER',I3)
29 RETURN
30 END

```



```

CFAS=C*ASS(01),STATPK
1  SUBROUTINE STATPK (DATA,END)
2  INTEGER END,I
3  REAL SUMX,SUMY,XVAR,YVAR,COV,ERR2RD,MEANX,MEANY,XVARI,YVARI,
4  * COVARI,CORREL,RTMEAN,DATA,DATNUM
5  DIMENSION DATA(400,2)
6
7  SUMX = 0.
8  SUMY = 0.
9  XVAR = 0.
10 YVAR = 0.
11 COV = 0.
12 ERR2RD = 0.
13 DATNUM = FLOAT(END)
14
15 DO 10 I = 1,END
16   SUMX = SUMX + DATA(I,1)
17   SUMY = SUMY + DATA(I,2)
18 10 CONTINUE
19
20 MEANX = SUMX/DATNUM
21 MEANY = SUMY/DATNUM
22
23 DO 20 I = 1,END
24   XVAR = XVAR + (DATA(I,1)-MEANX)**2.
25   YVAR = YVAR + (DATA(I,2)-MEANY)**2.
26   COV = COV + ((DATA(I,1)-MEANX)*(DATA(I,2)-MEANY)).
27   ERR2RD = ERR2RD + (DATA(I,1)-DATA(I,2))**2.
28 20 CONTINUE
29
30 XVARI = XVAR/(DATNUM-1)
31 YVARI = YVAR/(DATNUM-1)
32 COVARI = COV/(DATNUM-1)
33 CORREL = COVARI/(SQRT(XVARI)*SQRT(YVARI))
34 RTMEAN = SQRT(ERR2RD/DATNUM)
35
36 PRINT 30,MEANX,MEANY,XVARI,YVARI,COVARI,CORREL,RTMEAN
37 30 FORMAT (2Y,6GROUND,T5UTH  ANALYZED,///
38 * 1X,MEAN',5X,F10.4,1X,F10.4,///
39 * 1X,VARIANCE',5F10.4,1X,F10.4,///
40 * 1X,COVARIANCE',5F10.4,1X,///

```

```

41 *
42 *
43 *
44 *
      IX, 'CORRELATION COEFFICIENT = ', F10.4, //,
      IY, 'ROOT MEAN SQUARE ERROR = ', F10.4, // // // //
      RETURN
      END

CFAS, CFAS2(0), VISIBL
1 SUBROUTINE VISIBL (TRUTH, ANYLZD)
2 INTEGER VISIB, DATNUM, TRUTH, ANYLZD, MISSING
3 REAL DATA, NBRMIS
4 DIMENSION TRUTH(20, 20, 15), ANYLZD(20, 20, 15), DATA(400, 2)
5
6 MISSING = -32768
7 DATNUM = 0
8 NBRMIS = 0.
9 VISIB = 3
10
11 DO 20 I = 1, 20
12   DO 15 J = 1, 20
13     IF (ANYLZD(I, J, VISIB) .EQ. MISSING) GO TO 10
14     DATNUM = DATNUM + 1
15     DATA(DATNUM, 1) = FLOAT(TRUTH(I, J, VISIB))
16     DATA(DATNUM, 2) = FLOAT(ANYLZD(I, J, VISIB))
17   GO TO 15
18
19   NBRMIS = NBRMIS + 1.
20 CONTINUE
21
22 CONTINUE
23
24 PRINT 30, NBRMIS, DATNUM
25 FORMAT (1X, 'OUT OF A POSSIBLE 400 VALUES, F4.0 WERE MISSING AND',
26          '14.0 WERE VALID VISIBILITIES.')
27 * CALL STATPK (DATA, DATNUM)
28 RETURN
29 END

```

```

CFAS*CFASS(0),WEATHR
1  SUBROUTINE WEATHR (TRUTH,ANYLZD)
2  INTEGER WETHER,DATNUM,IRUTH,ANYLZD,MISSNG
3  REAL DATA,NBRMIS
4  DIMENSION TRUTH(20,20,15),ANYLZD(20,20,15),DATA(400,2)
5
6  MISSNG = -32769
7  DATNUM = 0
8  NBRMIS = 0.
9  WETHER = 6
10
11  DO 20 I = 1,20
12    DO 15 J = 1,20
13      IF (ANYLZD(I,J,WETHER) .EQ. MISSNG) GOTO 10
14      DATNUM = DATNUM + 1
15      DATA(DATNUM,1) = FLOAT(TRUTH(I,J,WETHER))
16      DATA(DATNUM,2) = FLOAT(ANYLZD(I,J,WETHER))
17      GOTO 15
18
19    NBRMIS = NBRMIS + 1.
20    CONTINUE
21  CONTINUE
22
23  PRINT 30,NBRMIS,DATNUM
24  FORMAT (1X,'OUT OF A POSSIBLE 400 VALUES',F4,' WERE MISSING AND',
25  *      'I4', WERE VALID PRESENT WEATHERS')
26  CALL STATPK (DATA,DATNUM)
27  RETURN
28  END

```

8.2 LISTINGS OF REVISED CFAS-CFAR PROGRAM ELEMENTS

```

C*AC*CRASS(1),BASE
1  BASE  PPOC
2  COMMON /BASE/ OXSECT, OYSECT, EDGE, IPLOCK, IDTIME, IOXUM,
3  IOYUM, INUMBR, ISTATI, ISYATO, JNUMBR, JSTATI, JSYATO, JTIME,
4  LASTJ, MAXCPS, NBJNCH, NPKFJ, NCOLS, NGX, NGY, NINI, NINTAB,
5  NROWS, NPB8FI, NPB8FJ, NSECTP, NWD8KI, NWD8KJ, NWD8EC, NXSECT,
6  NYSECT, UTMPED, XBASE, XMAX, XMIN, YBASE, YMAX, YMIN,
7  NNEWPS(100), NALLPS(100), ITAPLS(4,200), IRJF(2200), JBUF(528),
8  JTIMES(100), IPXMAX, IPXMIN, IPYMAX, IPYMIN
9
10 DATA KWCPDS /3871/
11
12  ENC

```

```

CFACT(1),CFMAYN/GRV
1 C
2 C
3 TEST DRIVER FOR THE CFACT
4 INTERP TASK, TIME, TYNOLD, CFASO, CROPV, CRD
5 COMMON /DATA/ JX, JY, JZ, TIME, TOS, ITYPE, IVALU, NCLC, NCEIL, NVV,
6 *MINRES, MAXICO, WREF, LOGV(8), ICL, ICS, ICH, ICS(10), NFEAT(7), IPW,
7 *IWD, IWS, IORS, IY, IYD, IYCS, NH, IZ, NC(10), IHS(10), ITHN(10), ICLG, ICLGV
8 *IYIC, NCIJF(56)
9 COMMON /CLOCK/ NCIJYM, LACTSK
10 COMMON /MAP/ XREF, YREF, CMFO
11 COMMON /OUTP/ IREQ, IEND, JPES, JENC
12
13 DIMENSION IDAT(143), JDAT(143), IZ(30), IZ(30), IZ(30), IOD(20), CICT(3)
14 *YMC(3), IEO(5), CFASO(5010), CROPV(20,20,5), IODN(10), Z(30), Z(30)
15 *I(30), DO(30)
16 EQUIVALENCE (IDAT(1), JY), (IDAT(23), ICL, IZ(1)), (IDAT(53), NC(1)), IP(1)
17 *), (IDAT(83), ICLG, IY(1)), (IDAT(117), IOD(1)), (IDAT(143), NREF),
18 * (CFASO(1), CROPV(1,1,1)), (CFASO(1), IODN(1))
19 DATA MISS/ -22766/
20 DATA NCFE/ 47
21 DATA GRD/ 56, LNTHY/ 500, LNTHY/ 500/
22 DATA XTRC/ 174.55, YTRC/ 7399.56, CHTIME/ 95.5/
23 DATA NCRWD/ 22, KRINC/ 5/
24 DATA NCCO/ ICS(5,2,3,4,5,8)
25 DATA DSE/ DZT, YMC(50), 20, 80, 100, 50, 100, 150, 7
26
27 LACTED
28 NOSTED
29 LACTSK = 0
30 XREF = ITRC
31 YREF = ITRC
32 CMDCRIMED
33 TOPLNTHY/ 500
34 JREFLNTHY/ 500
35 TOSNOSTOP, JOR, 15, 10
36 S OSAD (5,1000) TASK, NOST, NCIJYM
37 * IOD FOR MA (8,10)
38 WRITE (8,2000) TASK, NOST, NCIJYM
39 * IOD
40 PRINT FORMAT(1,5X,15CK=,14,5X,NPRT=,14,5X,NCIJYM=,15)

```



```

41      GO TO (130,10,200,200),TASK
42      10 GO TO I=1,143
43      20 TOAT(I)=MISS
44      READ (5,1000,END=140) JX,JY,JZ,IITIME,ITYPE,IVIS,NC
45      MFC=IABS(ITYPE/10)
46      ITYPE=MOD(ITYPE,10)
47      MT=IABS(ITYPE)
48      GO TO (30,30,30,30,100),MT
49      30 IF(NPRT .EQ. 0) GO TO 33
50      WRITE (6,2005)
51      2005 FORMAT(/)
52      WRITE (6,2010)JX,JY,JZ,IITIME,ITYPE,IVIS,NC
53      2010 FORMAT(4X,'JY',8X,'JY',8X,'JZ',8X,'IITIME',8X,'ITYPE',8X,'IVIS',8X,
54      'NC',/7(2X,15,2X)/)
55      33 GO TO (35,50,40,80,100),MT
56      35 READ (5,1000) ICLG,ICLGV,IVISC
57      IF(NPRT .EQ. 0) GO TO 50
58      WRITE(6,2020) ICLG,ICLGV,IVISC
59      2020 FORMAT(3X,'ICLG',8X,'ICLGV',8X,'IVISC',/Z(2X,15,2X)/)
60      GO TO 50
61      40 READ (5,1000) ITSC,NH,ICL,IH,ICM,ICH,TPW
62      IF(NPRT .EQ. 0) GO TO 50
63      WRITE(6,2030) ITSC,NH,ICL,IH,ICM,ICH,TPW
64      2030 FORMAT(3X,'ITSC',7X,'NH',7X,'ICL',8X,'IH',7X,'ICM',7X,'ICH',7X,'IP
65      'W',/7(2X,15,2X)/)
66      50 READ (5,1000) (NWEA(I),I=1,7)
67      IF(NPRT .EQ. 0) GO TO 55
68      WRITE (6,2035) (NWEA(I),I=1,7)
69      2035 FORMAT(2X,'NWEA(1)',3X,'NWEA(2)',3X,'NWEA(3)',3X,'NWEA(4)',3X,'NWE
70      'A(5)',3X,'NWEA(6)',3X,'NWEA(7)',/7(3X,14,3X)/)
71      55 IF(NC .EQ. 0) GO TO 110
72      READ (5,1010) (NC(I),ICTE(I),IHS(I),IITH(I),I=1,NC)
73      1010 FORMAT(4I10)
74      IF(NPRT .EQ. 0) GO TO 110
75      WRITE(6,2040)
76      2040 FORMAT(4X,'NC',9X,'ICTE',8X,'IHS',9X,'IITH',/)
77      WRITE (6,2050) (NC(I),ICTE(I),IHS(I),IITH(I),I=1,NC)
78      2050 FORMAT(4(2X,15,4X))
79      GO TO 110
80      IF(NPRT .EQ. 0) GO TO 85
81      WRITE (6,2005)

```

```

32 WRITE(6,2050) JX,JY,JZ,IYTIME,IYTYPE
33 FORMAT(4X,'JX',2X,'JY',2X,'JZ',2X,'IY',IYTIME,'IY',IYTYPE,'/F(2X,1E,2X)/')
34
35 I=0
36 I=I+1
37 READ (6,1000) IZ(I),IP(I),II(I),IDD(I)
38 Z(I)=FLCAT(IZ(I))
39 IY(I)=IY(I)+2732
40 P(I)=FLCAT(IP(I))*1
41 F(I)=ABS(P(I))
42 Y(I)=FLCAT(IY(I))*1
43 DD(I)=FLCAT(IDD(I))*1
44 IF((IP(I) .EQ. 0) .OR. (IP(I) .EQ. MISS)) GO TO 90
45 NPROFI
46 IF(NPROF .EQ. 0) GO TO 110
47 WRITE (6,2070)
48 FORMAT(2X,'IZ',10X,'IP',10X,'II',10X,'IDD',10X,'Z',12X,'P',11X,'Y',
49 '11X','DD')
50 WRITE(6,2080) IZ(I),IP(I),II(I),IDD(I),Z(I),P(I),Y(I),DD(I),Z=1,
51 'NPROF')
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127 150 WRITE (6,3000) LAST
128 2000 FORMAT(1,10X,NUMBER OF OBSERVATIONS INTERPRETED =,I4,
129 /,1X,12 TIME IORC ITYPE IVALU NYCLC NCFIL
130 * NVV MINPAC MAXTOP MSPME LAY1 LAY2 LAY3 LAY4 LAY5 LAY6 LAY7 LAY8
131 * LAY9)
132 DO 155 JMC(1,LACTION)
133 IF (MCO(JMC,50) .EQ. 0) WRITE (6,3000)
134 CALL BLKIN(NRWDI,JDAT,JDAT,JC,VC,XLN,VLN,LAST,TYMOLO,DSP,DIST,TYMC
135 155 WRITE (6,2010) (JDA*(LJM),LJME,22)
136 2010 FORMAT(3X,I5,1Y,I5,1Y,I5,2X,I4,1X,I4,2X,I3,3X,I2,2X,5(I6,1X),1X,9(
137 * I4,1X))
138 160 CONTINUE
139 CALL EXECUTASK,TIME,JDAT,VC,VC,XLN,VLN,LAST,TYMOLO,DSP,DIST,TYMC
140 * ISSO,NCSO,NBKOUT,IDENT)
141 GO TO 5
142 200 READ (5,1000) NBKOUT 3 INPUT LAST RECORD NUMBER ON CF03
143 WRITE (6,2049) NBKOUT
144 2049 FORMAT (1Y,4NBKOUT = ,I5)
145 READ (5,1000) TIME,TYMOLO
146 WRITE (6,2100) TIME,TYMOLO,NSSO,(IOT(I),I=1,NCSO)
147 2100 FORMAT(/2X,TIME,5X,TYMOLO,5X,NSSO,4X,ISSO(1),7X,ISSO(2),
148 * 3X,ISSO(3),3X,ISSO(4),/8(2X,I6,2X)/)
149 WRITE (5,2110) DSP,(DIST(I),I=1,3),(TYMC(I),I=1,3)
150 2110 FORMAT(/5X,3D2,5X,DIST(1),5X,DIST(2),5X,DIST(3),5X,TYMC(1
151 * ),5X,TYMC(2),5X,TYMC(3),/7(2X,F8.1,2X)/)
152 IF (ASK .EQ. 3) GO TO 250
153 READ (5,1020) XC,VC,XLN,VLN
154 1020 FORMAT(8F10.1)
155 WRITE (6,2120) XC,VC,XLN,VLN
156 2120 FORMAT(/5X,XC,10X,VC,9X,XLN,9X,VLN,4(2X,F8.1,2X))
157 250 NBKOUT=NBKOUT+1
158 IF (LACTICK .EQ. 0) LACTICK = 7
159 READ(5,2100) IDENT
160 2100 FORMAT(I045)
161 CALL EXECUTASK,TIME,JDAT,XC,VC,XLN,VLN,LAST,TYMOLO,DSP,DIST,TYMC
162 * ISSO,NCSO,NBKOUT,IDENT)
163 LASTCV=LASTK
164 IF (APPY .EQ. 0) GO TO 5
165 NWDPLN=ICD5
166 CALL BLKIN(NWDPLN,CF10,CF10,NBKOUT,NCF,IDENT)
167 WRITE (6,2170) NBKOUT

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164      2138 FORMAT(11,1X,'CONTENTS OF BLOCK NO.',I3,' OF THE CDR FILE',//)
165      WRITE (6,2140) (CFAC(I),I=1,10)
166      2140 FORMAT(4X,'IDFNAME ',10A6//4X,'GRID POINT DATA FOLLOWS',//)
167      LYNCE11
168      250 WRITE (6,2150)
169      2150 FORMAT(2X,11,4X,'J',4X,'SAYC',4X,'CEYL',5X,'VIS',5X,'BASE',4X,'TO
170      *P',5X,'WE',4X,'3X,'LAY1',4X,'LAY2',4X,'LAY3',4X,'LAY4',4X,'LAY5',4X
171      *',LAVF',4X,'LAY7',4X,'LAY8',4X,'LAY9',//)
172      DO 280 I=1,53,IEND
173      DO 280 J=JBECS,JEND
174      LYNCELYNC+1
175      IF(LYNC .LT. 54) GO TO 270
176      LYNCE2
177      WRITE (6,2160)
178      2160 FORMAT(11)
179      WRITE (6,2170)
180      2170 WRITE (6,2170) I,J,(COPPV(I,J,M),M=1,15)
181      2170 FORMAT(1X,12,3X,12,4X,13,4X,16,2X,16,2X,16,2X,16,4X,12,2X,9(1X,16
182      *1X))
183      280 CONTINUE
184      GO TO 5
185      END

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CFAD,CFAD(1),CFAD2
1  SUBROUTINE CFAD(IREQ,IEND,JREQ,JEND,DIST,TMCO,ISUB,NDCO,MNDR,
2  ,MTIME,NCB)
3
4  C THIS ROUTINE USES THE BEST REPORTS GENERATED BY COMOPR TOGETHER-
5  WITH THE CPOB PARAMETERS AT SPECIFIED GRID POINTS IN THE WINDOW.
6
7  C INPUT DATA
8
9  C IREQ = I INDEX OF LEFT HAND EDGE OF WINDOW OR SUB-WINDOW.
10 C IEND = I INDEX OF RIGHT HAND EDGE OF WINDOW OR SUB-WINDOW.
11 C JREQ = J INDEX OF BOTTOM EDGE OF WINDOW OR SUB-WINDOW.
12 C JEND = J INDEX OF TOP EDGE OF WINDOW OR SUB-WINDOW.
13 C DIST = DISTANCE CONSTANTS IN WEIGHTING FUNCTION, KM.
14 C TMCO = TIME CONSTANTS IN WEIGHTING FUNCTION, MINUTES.
15 C ISUB = SEARCH SQUARE SIZES, NO. OF GRID POINTS.
16 C NDCO = NUMBER OF SEARCH SQUARES.
17 C MNDR = MINIMUM NUMBER OF BEST REPORTS REQUIRED TO CALCULATE CPOB
18 C PARAMETERS AT A GRID POINT.
19 C MTIME = MAP TIME (0 = 1440).
20 C NCB = NUMBER OF CPOB/REP.
21
22 C INTERIOR CPOB/REP.
23
24
25 COMMON /INTCOP/ INDCO(2),ICD
26 COMMON /CPOB/ NOUZI(10),CPOB(120,20,15)
27
28 DIMENSION JI(100),TSC(15),DIST(7),TMCO(2),VAP(120),NPT(100)
29
30 DATA MISS /-32768/
31 DATA CPO/25,LENTHX/500,LENTHY/500,NDR/100,MNDR/100/
32
33 TPELNTHX/200
34 TPELNTHY/200
35
36
37 C OTHER THROUGH THE CPOB PARAMETERS
38 DO 220 M=1,2
39 WRITE
40 TPELNTHX, 21, M, 1, 1

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41 SEARCH REPT REPORT OCCURER AND GENERATE A POINTER TABLE TO THOSE
42 REPORTS HAVING INFORMATION ON THE CSDO PARAMETER BEING ANALYZED.
43
44 NUMBER
45 DO 20 N=1,NCP
46 IF(INCDS(M,N) .CG. MISS) GO TO 20
47 NUVENUM+1
48 JPTNUM)EN
49 DO CONTINUE
50
51
52 STEP THROUGH GRID POINTS.
53
54 DO 210 I=1,EGS*1END
55 TXDEGRD*(I-1)*10
56 DO 210 J=JBF0*JEND
57 IYDEGRD*(J-1)*10
58 NDED
59
60 22 NPT(NJ)=JPT(NJ)
61 NMP)ENUM
62
63 STEP THROUGH SEARCH SQUARES OF INCREASING SIZE.
64
65 NCGE1
66 TFM)MPT *LE. ( ) GO TO 65
67 JSDEGRD*1000(N*10)*10
68 N=1
69 N)NEMPT(N)
70 NYD=INCSS(1,N)
71 NYD=INCSS(2,N)
72 TXDEGRD*(IYD-NYD)
73 IYD=IABS(IYD-NYD)
74 TFM(IYDF *GT. JSD) .CG. (IYDF *GT. JSD) GO TO 50
75 NDCENMPT+1
76 N)NPT(MD)EN)
77 TFM .CG. NMD) GO TO 50
78 N)N)NEMPT-1
79 DO 40 M=1,N)MPT
80 40)NPT(M)EN)MPT+1

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81 GO TO 30
82 N=N+1
83 IF(N-NUMPT) 30,30,70
84
85 JUMP TO 90 IF THE MINIMUM NUMBER OF BEST REPORTS USABLE AT THE
86 CRIO POINT HAS BEEN FOUND.
87
88 N=NUMPT-1
89 TIME=0.05. MV3?) GO TO 90
90 N=N+1
91
92 JUMP TO 80 IF THE LARGEST SEARCH SQUARE HAS BEEN EXCEEDED.
93
94 TF(N50-N550) 25,25,80
95
96 JUMP TO 90 IF AT LEAST ONE BEST REPORT LYING WITHIN THE LARGEST
97 SEARCH SQUARE HAS BEEN FOUND.
98
99 IF(N50 .GT. 0) GO TO 90
100 M=EM-7
101 CRD=V(I,J,MP)=MISS
102 GO TO 210
103 TT=0
104 SMW=0.
105 SMWF=0.
106 DO 180 N=1,N50
107 N=EMPT(N)
108 DX=(IXD-INCR(1,NB))**.2
109 DY=(IYD-INCR(2,NB))**.2
110 DIS=SQRT(DX**2+DY**2)
111 TDETIME=INCR(4,NB)
112 IF(TD .LT. 0) TD=1440+TD
113 IF(INCR(3,NB) .EQ. MISS) GO TO 100
114 L=IABC(INCR(22,NB))
115 L=MOD(L,10)
116 IF(L .GT. 3) L=3
117 YC=TYMC(L)
118
119 CCR=IS(L)*10.
120 GO TO 110
121 YC=TYMC(3)

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121 DC=DIAT(3),M.
122 LGDEFINOR(7,M,NB),CXP(-((CIS/CO),,2)-((IIO/IO),,2))
123 GO TO (140,120,120,140,140,150,130),MST
124 TP(INOR(7,M,NB),.LT.,0) EXECIO,1
125 LGDEFINOR(7,M,NB)
126 IF(M.NE.9) GO TO 150
127 LOGELOC/IO
128 GO TO 120
129 LGDEFINOR(INOR(M,NB),5)
130 TP(LCO .50, 1) EXECIO,1
131 LGDEFINOR(M,NB)-LCO
132 GO TO 150
133 LGDEFINOR(M,NB)
134 GO TO 150
135 TP(WF .LT. SMWF) GO TO 120
136 CMWCFWF
137 TOPVEINOR(11,M,NB)
138 GO TO 120
139 ORSELCO
140 SMWCFMWF+WF
141 CMWCFMWF+(WF*OR3)
142 CONTINUE
143 IF (M .EQ. 13) GO TO 137
144 IF (SMWF - 1.(WF-18) 183,184,184
145 IF (SMWF .GT. 1.05-18) GO TO 200
146 TBPVED
147 GO TO 200
148 TOPVEMISS
149 GO TO 200
150 CONTINUE
151 XITGETC
152 XNDEFND
153 FRACXITG/XNFD
154 CPVECMWF/CMWF
155 GO TO (135,130,130,135,135,200,185),MST
156 CPVEGFV+2.5
157 TOPVCPV/3
158 TOPVEIGPV*5
159 IF(IGPV .GT. 0) GO TO 200
160 TP(FRAC .LT. .5) GO TO 200

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169 VPV=16PV+1
170 CO TO 200
190 IF(FRAD*.35*.5) CPV=-CPV
195 16PV=CPV+.5
200 MCZEM=7
CPCEV(I,J,MCZ)=CPV
210 CONTINUE
220 CONTINUE
RETURN
END

```

000500000001).COMSEP
1  SUBROUTINE COMBINE(OBS,DIR,TIME,LEFILE)
2  RANKS, RESOLVED CONFLICTING INFORMATION, AND COMBINES CFBP ELP-
3  MENTS OF APPROXIMATE OBS/REPS: THEN INCURSED INTERNAL CONSISTENCY OF
4  COMBINED OBS/REP
5
6  INTERP SPD,CPEL,TIME
7
8  COMMON /MAP/XDEF,YDEF,CWEN,LNTHX,LNTHY,SPD
9  COMMON /INTCBB/INCRS(23,100)
10
11  DIMENSION GSEL(24,10),MTEMP(24),NRES(11),DE(11)
12
13  DATA NWD3LK/23/
14  DATA MISS/-237F3/
15  DATA NDB2/100/
16
17  DOBHECDB,14.
18  NWDOUTED
19  DO SUB NEM,NOR
20  TOTEL
21  DO 20 NEM,23
22  GSEL(M,IC)=INCRS(M,N)
23  CPEL(24,IC)=1
24
25
26  C  COLLECT THE CLOSEST 10 OR LESS OBSERVED TO THE SITE OF OBSERVED NO.
27  C  INCRS(5,N), CALLED THE BEST REPORT SITE, WHICH ARE NO MORE THAN
28  C  500 KM. FROM THE BEST REPORT SITE.
29
30  DO 10 NEM,NOR
31  TE(NM,50,N) GO TO 35
32  EXCE(INCR(1,N)-INCRS(1,N))**2
33  DYSE(INCRS(2,N)-INCRS(2,N))**2
34  DISTERRT(OXS+OVS)
35  TE(DIST,50,DEPH) GO TO 35
36  TOTERRT+1
37  NRES(10Y)EMN
38  GSEL(10Y)EDIEY
39  IF(10Y,LF,2) GO TO 35
40  JXERRT
41
42  IF(25(JX),.05,DE(JX-1)) GO TO 30

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41 DIMEN(JX-1)
42 NYMENREC(JX-1)
43 DC(JX-1)=DC(JX)
44 NREC(JX-1)=NREC(JX)
45 DC(JX)=DCM
46 NREC(JX)=NTM
47 JX=JX-1
48 IF (JX .GT. 1) GO TO 22
49 IF (IC1 .GT. 1) IC1=10
50 IF CONTINUE
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C JUMP TO 48 IF OTHER CODE/REP ARE WITHIN 500 KM. OF EGSY REPORT SITE

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59 IF (IC1 .GT. 1) GO TO 48
60 DO 38 M=1,22
61 M=MEMB(M)=OPEL(M,IC1)
62 GO TO 222
63 DO 42 IC2=IC1
64 NYMENREC(IC2)
65 DO 43 M=1,22
66 OPEL(M,IC2)=MEMB(M,NY)
67 OPEL(24,IC2)=IC
68 CONTINUE
69 DO 50 NREP=IC1
70 NREP=NB

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C BANK OBSERVED ON BASIS OF TIME OF RECEIPT

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59 TIME=TIME-OPEL(4,NREP-1)
70 IF (IC1 .LT. 0) TIME=TIME+1440
71 TIME=TIME-OPEL(4,NREP)
72 IF (IC2 .LT. 0) TIME=TIME+1440
73 IF (IC2 = IC1) TIME=TIME

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C BANK OBSERVED ON BASIS OF TIME AT FOLLOWING:

BANK	TYPE
1	AIRWAYS
2	WETAS
3	EXADR
4	BASE

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81 C S AFWNC-30NEPH
82
83 00 JTRLEVA001(CPEL(16,NP2-1))
84 JTRLEVA00(CPEL(16,NP2))
85 IF (JTR2 - JTR1) 80,85,80
86 RANK ON BASIS OF VALUE OF OBS/REP.
87 IF (CPCL(17,NP2-1) - CPCL(17,NP2)) 80,70,80
88 RANK OBS/REP ON THE BASIS OF URGENCY.
89 ICMY122
90 IF (CPCL(16,NP2-1) .LT. 0) ICMY121
91 ICMY222
92 IF (CPCL(16,NP2) .LT. 0) ICMY221
93 IF (ICMY2 - ICMY1) 80,75,80
94
95 C RANK ON DISTANCE FROM BEST REPORT CITY.
96
97 75 IF (CPCL(24,NP2-1) .LE. CPCL(24,NP2)) 80 TO 80
98 80 80 85 M121,24
99 MTEMP(MT)ECPCL(MT,NP2-1)
100 CPCL(MT,NP2-1)ECPCL(MT,NP2)
101 85 CPCL(MT,NP2)MTEMP(MT)
102 NP2NP2-1
103 IF(NP2 .GE. 2) 80 TO 85
104 80 CONTINUE
105
106 C CREATE A BEST REPORT BY THE DATE OF OBS/REP NO. INCR(15,N).
107 C ASSIGN THE LOCATION, STATION ELEVATION, TIME SEQUENCE NO. AND
108 C TYPE OF OBS/REP NO. INCR(15,N) TO THIS BEST REPORT.
109
110 80 100 M21,F
111 100 MTEMP(MT)INC(15,M,N)
112
113 C INITIALLY ASSIGN THE CP22 PARAMETER OF THE LOWEST RANKING OBS/REP
114 C WITHIN 100 KM. OF THE BEST REPORT DATE TO THE BEST REPORT.
115
116 M21F10
117 MVALECPCL(7,IC2)
118 80 170 M2R,22
119 MTEMP(MT)ECPCL(M,IC2)
120

```



```

121 C JUMP TO 130 FOR ALL CF08 PARAMETERS EXCEPT THE CEILING
122
123 TF(M,NE,3) GO TO 130
124
125 C DETERMINE THE CODE NO. INDICATING THE METHOD BY WHICH THE CEILING
126 WAS MEASURED.
127
128 KL1=IABS(CPEL19,IC1))
129 KL1=MOD(KL1,10)
130
131 C ALSO UPWARD THROUGH RANKED STARS AND REPLACE CF08 PARAMETERS
132 PREVIOUSLY ASSIGNED TO BEST REPORT BY CORRESPONDING PARAMETERS IN
133 ORANGE OF HIGHER RANK LOCATED WITHIN 500 KM. OF BEST REPORT SITE.
134 DO NOT MAKE THE REPLACEMENT IF THE CF08 PARAMETER IN THE HIGHER
135 RANKING OBS/OBS IS MISSING.
136
137 GO TO 170 IF(.NOT
138 TPVACT+1)-
139 IF(GPFL(M,IPV) .EQ. MISS) GO TO 170)
140
141 C JUMP TO 150 FOR ALL PARAMETERS EXCEPT CEILING
142
143 TF(M,NE,3) GO TO 150
144 KL2=IABS(CPEL1M,IPV))
145 KL2=MOD(KL2,10)
146
147 C DO NOT REPLACE CEILING UNLESS METHOD OF CEILING DETERMINATION IN
148 HIGHER RANKING OBS/OBS IS ALSO A HIGHER RANKING METHOD THAN WAS
149 USED IN DETERMINING THE CEILING VALUE PRESENTLY ASSIGNED TO THE
150 BEST REPORT.
151
152 TF(KL1 .LE. KL2) GO TO 170
153 KL1=KL2
154 M=MAX(M,IPV)
155 GO TO 170
156
157 C INSURE THAT TOTAL SKY COVER IS NOT LESS THAN THE REPORT CLOUD
158 COVER IN ANY LAYER.
159
160 GO TO 170 WITH 00

```

```

161 MTEMP(1)=MVAL(MTEMP(3),MTEMP(M))
162
163 TNSURE MINDAS LESS THAN MAXTOP
164
165 IF(MTEMP(12).LE. MTEMP(11)) MTEMP(12)=MIND
166 DO 210 I=1,NCT
167 I=I+1
168 IF(IABS(COEL(I,IRV)) .GT. 3) .OR. IABS(23,IRV) .EQ. MISS) GO TO
169 .270
170 MTEMP(23)=COEL(23,IRV)
171 MVAL=MVAL+COEL(17,IRV)
172 MVAL=MVAL/IC
173 MTEMP(17)=(12*INCS(7,N))+MVAL)/3
174 NSKOUT=NSKOUT+1
175 CALL BLKOUT(NHORBK,MTEMP,NBKOUT,LCFILT,ISTAT)
176
177
178 DO 370 N=1,NSKOUT
179 CALL BLKIN(NHORBK,MTEMP,N,LCFILT,ISTAT)
180 DO 320 M=1,02
181 INCS(M,N)=MTEMP(M)
182 CONTINUE
183 RETURN
184 END

```

```

CEAS*CFAS*01).EXECI
1 SUBROUTINE EXECI(TASK,TIME,OBSPER,FILE,LAST,XY,OLDF,NEW,MOD)
2
3 INPUT DATA (FORMAL PARAMETERS)
4
5 TASK = TASK REQUESTED BY PROGRAM
6 1 = SET UP THE OBSERVER STORAGE FILE
7 2 = INPUT OBSERVER
8 3 = CREATE A NEW OBS
9 4 = UPDATE THE LATEST OBS ON FILE
10 5 = REFERENCE TIME OF OBS CREATION OR UPDATE
11 6 = OUTPUT UPDATED COMMON BLOCK DATA TO MASS STORAGE
12 7 = OBSERVER
13 8 = SEQUENCE NUMBER OF THE LATEST OBSERVER STORED.
14 9 = TIME OF CLOSEST OBSERVER TO BE USED IN A CREATION OR UPDATE
15
16 DATA STATEMENTS
17
18 LSFILF = LOGICAL DEVICE NO. OF TEMPORARY STORAGE FILE USED IN
19 'CONDB'.
20 NMAX = MAXIMUM NUMBER OF OBSERVER THAT CAN BE USED IN A CREATION
21 OR UPDATE.
22
23 OBS/PER INPUT ELEMENTS
24
25 TX = X DISTANCE OF OBSERVER GIVE FROM TYPE, HECTOMETERS.
26 TY = Y DISTANCE OF OBSERVER SITE FROM TYPE, HECTOMETERS.
27 TZ = OBSERVER SITE ELEVATION ABOVE MEAN SEA LEVEL, METERS.
28 ITIME = TIME OF OBSERVER (0-1440)
29 ITYPE = TYPE OF OBSERVER
30 1 = AIRWAY, -1 IF A SPECIAL.
31 2 = METAR, -2 IF A SPECIAL (CORRECT)
32 3 = SYNOB
33 4 = UPPER AIR (PACR), -4 IF A SPECIAL
34 5 = AFWC TO-NEPH OUTPUT
35
36 FOR EXPLANATION OF REMAINING OBSERVER INPUT ELEMENTS CONSULT
37 LISTINGS OF SUBROUTINE OFPNT IF A SURFACE OBSERVER OR
38 SUBROUTINE UARNT IF AN UPPER AIR OBSERVER.
39
40 OBS PARAMETERS DETERMINED FROM OBS/PER.
41

```

41 C T020 = SEQUENCE NO. OF OBS/SEC.
 42 C TVALU = CROSS INFORMATION VALUE OF THE OBS/SEC
 43 C ATCLO = TOTAL CLOUD COVER, 100 TO 1000.
 44 C MCEIL = HEIGHT OF CEILING LAYER (AGL), DEKAMETERS. MINUS IF A
 45 C VARIABLE CEILING. LAST DIGIT OF MCEIL INDICATES THE
 46 C METHOD BY WHICH THE CEILING WAS DETERMINED.
 47 C 1 = MEASURED
 48 C 2 = AIRCRAFT
 49 C 3 = BALLOON
 50 C 4 = RADAR
 51 C 5 = ESTIMATED
 52 C 6 = INDEFINITE

53 C MWV = OBSERVING SURFACE VISIBILITY, METERS. MINUS IF VARIABLE.
 54 C MWBAC = HEIGHT OF BASE OF LOWEST CLOUD, DEKAMETERS.
 55 C MAXTOP = HEIGHT OF TOP OF HIGHEST CLOUD THAT COULD BE DETERMINED
 56 C FROM OBSERVED ELEMENTS, DEKAMETERS.

57 C MCODE = MOST SIGNIFICANT PRESENT WEATHER ELEMENT. (MWO CODE 4577)
 58 C LCOV(T) = PERCENT CLOUD COVER IN THE OCFR LAYER, 100 TO 100).
 59 C
 60 C
 61 C
 62 C
 63 C
 64 C
 65 C
 66 C
 67 C
 68 C
 69 C
 70 C

CFR LAYERS

LAYER	0 FEET	0 METERS	150 FEET	45 METERS
1	150	45	300	91
2	300	91	600	183
3	600	183	1000	300
4	1000	300	2000	610
5	2000	610	3000	1057
6	3000	1057	5000	1524
7	5000	1524	6500	1981
8	6500	1981	10000	3042

71 C
 72 C
 73 C
 74 C
 75 C
 76 C
 77 C
 78 C
 79 C
 80 C

```

81 EQUIVALENCE (KOBPR(1),IX)
82
83 DATA LSFILF(3),NOBR/100/
84 DATA KNUMBER /0/
85 DATA IPRT/5/
86 DATA NOBRPT/22/,KFINO/5/
87 DATA MISS/- 32768/
88
89 GO TO (2,2,70,70,125),TASK
90 2 7F (LASTEK .LE. 2) GO TO 5
91
92 C RETRIEVE THE CONTENTS OF COMMON /BASE/ FROM MASS STORAGE.
93
94 CALL BLKIN(KWORDS,DXSECT,1,KNUMBER,KSTATI)
95 WRITE (6,1000) NINI,IBLOCK,NBJNOH,INUMBR,ISTATI,ISTATC,JNUMBER,JSTA
96 ,TI,JSTATO,JTIME,LAJ
97
98 5 CONTINUE
99 GO TO (10,20,70,70),TASK
100
101 C COME HERE TO INITIALIZE AND SET UP OBS/REP STORAGE FILES
102
103 10 CALL BEGIN
104 IOBC=0
105 RETURN
106
107 C COME HERE TO INTERPRET AND FILE AN OBS/REP.
108
109 20 DO 25 K=1,143
110 25 KOBPR(K)=OBSRPT(K)
111 IOBC=LAST+1
112 NTR=IABS(IITYPE)
113 GO TO (30,30,30,40,50),NTR
114
115 C COME HERE TO INTERPRET A SURFACE OBS/REP
116
117 30 CALL SFDINT
118
119 GO TO 50
120
121 C COME HERE TO INTERPRET AN UPPER AIR OBS/REP.

```



```

121 C
122 40 CALL UADINT
123 GO TO 50
124 C
125 C COME HERE TO PROCESS CLOUD-LOG DATA FROM THE AFGWC 30-NEPH OUTPUT
126 C
127 50 CALL AFDINT
128 60 DO 65 K=1,44
129 65 OBSRPT(K)=K03R(K)
130 IF (DENSE SWITCH 1) (7,60)
131 CALL BLKOUT(N03WRT,0BSRPT,1000,K*FIND,TSTAT)
132 CONTINUE
133 CALL STOREC(OBSRPT)
134 LAST=IOBC
135 IF(LAST .EQ. N03R) LAST=0
136 RETURN
137 70 N03=0
138 IF(LASTCK .LE. 2) GO TO 80
139 C
140 C RETRIEVE THE CONTENTS OF COMMON /BASE/ FROM MASS STORAGE.
141 C
142 CALL BLKIN(KWORDS,DXDECT,I,KNUMBER,KETATII)
143 WRITE (6,3000) NINI,I,BLOCK,N3JNCH,INUMBR,ISTATI,ISTATC,JNUMBER,JSTA
144 *II,JSTATC,TIME,LASTJ
145 C
146 80 INCODE=1
147 C
148 C INSURE THAT TTMOLD IS NOT MORE THAN 1080 MINUTES (18 HOURS) PRIOR
149 C TO TIME. RESET TTMOLD TO TIME-I080 IF NECESSARY.
150 C
151 IDIFF=TYMDF(TIME,TTMOLD)
152 IF(IDIF .GT. 0) GO TO 90
153 C
154 C RETURN IF TTMOLD IS MORE THAN 24 HOURS PRIOR TO TIME
155 C
156 WRITE(IPRI,1990) TTMOLD, TIME
157 1990 FORMAT(' TTMOLD=,15, IS EITHER MORE THAN 24 HOURS PRIOR TO TIME,
158 *15, OR IS MORE RECENT THAN TIME.'). TASK CANNOT BE COMPLETED W:
159 *14 THIS AMBIGUITY.*/)
160 IF(IDIF .LE. 1080) GO TO 100

```



```

161 YMCOLD=TIME-1080
162 IF(YMOLD .LT. 0) YMOLD=1440+YMOLD
163
164 WRITE(IPRI,2000) IDIF, YMCOLD
165 2000 FORMAT(' TIME DIFFERENCE BETWEEN REFERENCE TIME AND TIME OF OLDEST
166 * USEABLE OBS/REP =',I3,' MINUTES',' TIME OF OLDEST USEABLE OBS/REP
167 *P RESPT TO ',I4,' MINUTES WHICH IS 1080 MINUTES PRIOR TO REFERENCE
168 * TIME'//)
169
170 C RETRIEVE OBS/REP IN REVERSE CHRONOLOGICAL ORDER FROM TIME TO
171 C YMOLD
172 C
173 C 100 CALL PETORR(INCODES,TIME,INCRFL,NOMDPE, YMCOLD)
174 INCODES=2
175 C
176 C JUMP TO 120 IF THERE ARE NO MORE OBS/REP IN THE DATA BASE.
177 C
178 C IF(NOMDPE .EQ. 1) GO TO 100
179 NOBENC2+1
180 CALL BLKOUT(I23,INCRFL,NDE,LSFILE,ISTAT)
181 C
182 C JUMP BACK TO 100 AND ATTEMPT TO RETRIEVE ANOTHER OBS/REP IF THE
183 C MAXIMUM UTILEABLE NUMBER HAS NOT BEEN REACHED.
184 C
185 C IF(NOR .LT. NOBR) GO TO 100
186 CONTINUE
187 IF(LASTSK .GE. 3) GO TO 130
188 C
189 C STORE THE CONTENTS OF COMMON /BASE/ ON MASS STORAGE.
190 C
191 C 125 CALL BLKOUT(KW0905,OXGECT,1,KNUMBER, KSTATI)
192 WRITE (E,3010) NINT,IBLOCK,NB,KNOW,INUMBR,ISTATI,ISTATO,JNUMBER,JSTA
193 *T,JUSTATO,JUSTIME,LASTJ
194 C
195 C 130 RETURN
196 2000 FORMAT(' CONTENTS OF COMMON /BASE/ HAS BEEN READ IN FROM MASS STOP
197 *AGE- '// NINT E',I7// IBLOCK E',I7// NB,KNOW E',I7// INUMBR E',I7//
198 *T,JUSTATO E',I7// ISTATO E',I7// JNUMBER E',I7// JUSTATI E',I7// JSTATO
199 * E',I7// JUSTIME E',I7// LASTJ E',I7//')
200 C 2010 FORMAT(' CONTENTS OF COMMON /BASE/ HAS BEEN OUTPUT TO MASS STORAGE

```

```

201      NIMI = '17'  TBLOCK = '17'  WINDW = '17'  INUMBR = '17'  IST
202      IATI = '17'  ISTATO = '17'  JNUMBER = '17'  JDATE = '17'  JSTATO =
203      '17'  JTIME = '17'  LASTJ = '17'  LASTJ = '17'  LASTJ = '17'
204      END

```

```
CFAS*CFAS(1),FXSC2
```

```

1  SUBROUTINE EXEC2(TASK,TIME,OPRPT,X0,Y0,XLN,YLN,LAST,TYMOLD,DSP,
2  *DIST,TYMC,ISSO,NSO,NBKOUT,IDENT,NOR)
3  C
4  C
5  C
6  C
7  C
8  C
9  C
10 C
11 C
12 C
13 C
14 C
15 C
16 C
17 C
18 C
19 C
20 C
21 C
22 C
23 C
24 C
25 C
26 C
27 C
28 C
29 C
30 C
31 C
32 C
33 C
34 C
35 C

```

INPUT DATA (FORMAL PARAMETERS)

TASK = TASK REQUESTED BY FRAME

1 = SET UP THE OBS/REP STORAGE FILES

2 = INPUT OBS/REP

3 = CREATE A NEW CFOS

4 = UPDATE THE LATEST CFOS ON FILE

TIME = REFERENCE TIME OF CFOS CREATION OR UPDATE

OBSREP = OBS/REP

X0 = DISTANCE EAST FROM XREF OF THE LOWER LEFT HAND CORNER OF THE SUB-WINDOW IN THE CFOS TO BE UPDATED, KM.

Y0 = DISTANCE NORTH FROM YREF OF THE LOWER LEFT HAND CORNER OF THE SUB-WINDOW IN THE CFOS TO BE UPDATED, KM.

XLN = EAST-WEST LENGTH OF UPDATED SUB-WINDOW, KM.

YLN = NORTH-SOUTH LENGTH OF UPDATED SUB-WINDOW, KM.

LACT = SEQUENCE NUMBER OF THE LAST OBS/REP STORED.

TYMOLD = TIME OF OLDEST OBS/REP TO BE USED IN A CREATION OR UPDATE

DSP = MAXIMUM DISTANCE BETWEEN OBS/REP TO BE COMBINED INTO A BEST REPORT, KM.

DIST = DISTANCE CONSTANT IN WEIGHTING FUNCTION, KM.

DIST(1) USED WHEN CONVECTIVE CLOUDS ONLY PRESENT.

DIST(2) USED WHEN CONVECTIVE AND MIDDLE CLOUDS ONLY ARE PRESENT OR WHEN SHOWERY TYPE PRECIPITATION PRESENT OR BEST WEATHER.

DIST(3) USED FOR ALL OTHER CASES.

TYMC = TIME CONSTANTS IN WEIGHTING FUNCTION, MINUTES.

TYMC(1) USED WHEN CONVECTIVE CLOUDS ONLY PRESENT.

TYMC(2) USED WHEN CONVECTIVE AND MIDDLE CLOUDS ONLY ARE PRESENT OR WHEN SHOWERY TYPE PRECIPITATION PRESENT OR BEST WEATHER.

TYMC(3) USED FOR ALL OTHER CASES.

36 C 1000 = SEARCH SQUARE SIZE, NO. OF GRID POINTS.
 37 C 1001 = NO. OF SEARCH SQUARES USED IN ANALYSIS.
 38 C 1002 = BLOCK NO. IN THE CFDB FILE TO WHICH THE CREATION OR
 39 C UPDATE IS TO BE TRANSFERRED.
 40 C 1003 = TEN WORDS OF USER SUPPLIED IDENTIFICATION INFORMATION THAT
 41 C PRECEDES THE CLOUD-FOG-WEATHER DATA ON THE FILE.
 42 C
 43 C DATA STATEMENTS
 44 C
 45 C LSFILE = LOGICAL DEVICE NO. OF TEMPORARY STORAGE FILE USED IN
 46 C 'COMOBN'.
 47 C NCCF = LOGICAL SYSTEM FILE NO. OF THE CFDB FILE.
 48 C ILPP = DEVICE NO. OF LINE PRINTER
 49 C ICPD = LOGICAL DEVICE NO. OF CONSOLE PRINTER.
 50 C GCRPH = CFDB GRID POINT HEIGHT, METERS.
 51 C MNER = MINIMUM NUMBER OF BEST REPORTS REQUIRED TO CALCULATE CFDB
 52 C PARAMETERS AT GRID POINT.
 53 C CPD = CFDB GRID. (GRID POINT SPACING, KM.)
 54 C LNTHX = EAST-WEST LENGTH OF THE CFDB WINDOW, KM.
 55 C LNTHY = NORTH-SOUTH LENGTH OF THE CFDB WINDOW, KM.
 56 C NOBR = MAXIMUM NUMBER OF OBSERVED THAT CAN BE USED IN A CREATION
 57 C OR UPDATE.
 58 C
 59 C CFDB PARAMETERS DETERMINED FROM OBS/REP.
 60 C
 61 C 1000 = SEQUENCE NO. OF OBS/REP.
 62 C 1001 = CFDB INFORMATION VALUE OF THE OBS/REP
 63 C 1002 = TOTAL CLOUD COVER, (00 TO 100)
 64 C 1003 = HEIGHT OF CEILING LAYER (AGL), DEKAMETERS. MINUS IF A
 65 C VARIABLE CEILING. LAST DIGIT OF NCEIL INDICATES THE
 66 C METHOD BY WHICH THE CEILING WAS DETERMINED.
 67 C 1 = MEASURED
 68 C 2 = AIRCRAFT
 69 C 3 = BALLOON
 70 C 4 = RADAR
 71 C 5 = ESTIMATED
 72 C 6 = INDEFINITE
 73 C 1004 = PREVAILING SURFACE VISIBILITY, METERS. MINUS IF VARIABLE.
 74 C 1005 = HEIGHT OF BASE OF LOWEST CLOUD, DEKAMETERS.
 75 C 1006 = HEIGHT OF TOP OF HIGHEST CLOUD THAT COULD BE DETERMINED
 76 C FROM OBS/REP ELEMENTS, DEKAMETERS.

```

77 C MSEPWE = MOST SIGNIFICANT PRESENT WEATHER ELEMENT. (WMC CODE 4877)
78 C LCOV(I) = PERCENT CLOUD COVER IN THE CPDB LAYER, (00 TO 100).
79 C CPDB LAYERS
80 C LAYER BOTTOM 0 FEET 0 METERS 150 FEET 45 METERS TOP
81 C 1 150 45 300 91
82 C 2 300 91 600 183
83 C 3 600 183 1000 305
84 C 4 1000 305 2000 610
85 C 5 2000 610 3500 1067
86 C 6 3500 1067 5000 1524
87 C 7 5000 1524 6500 1981
88 C 8 6500 1981 10000 3046
89 C
90 C
91 C

```

```

92 C INTEGER TASK, TIME, OBSRPT, SKYCOV, CEILING, CLOBAS, CLDT OP, WEATHR, VISIB,
93 C *GRD, GRDPH, GRDPV, TYPOLD, CFASD

```

```

94 C
95 C COMMON /MAP/ XREF, YREF, CMPD, LNX, LNY, GRPDC
96 C COMMON /INTOBR/ INCRS(23, 100)

```

```

97 C COMMON /CFDB/ JOENT(10), SKYCOV(20, 20), CEILING(20, 20), VISIB(20, 20),
98 C *CLDBAS(20, 20), CLDTOP(20, 20), WEATHR(20, 20), LAYCOV(20, 20, 9)

```

```

99 C COMMON /CUIPT/ IBCG, IEND, JEEG, JEND
100 C DIMENSION GRDPV(20, 20, 15), DTST(3), TYP(3), ICS(9(5)), LCOVA(9),
101 C *LCOVE(9), CFASD(610), JOENT(10)

```

```

102 C INCLUDE GRDPTG, LIST
103 C
104 C EQUIVALENCE (CFASD(11), GRDPV(1, 1, 1), SKYCOV(1, 1))
105 C

```

```

106 C DATA LSFILF(3), NCOFF/4/, NOBR/100/
107 C DATA MISS/ -32769/
108 C DATA MBR/ 1/

```

```

109 C DATA GRD/25/, LNTHX/500/, LNTHY/500/
110 C IP=LNTHX/GRD
111 C JP=LNTHY/GRD

```

```

112 C ICF08=10+(IP*JP*15)
113 C JP=JP*JP
114 C DO 70 IE1, NOR

```

```

115 C CALL BLKIN(23, INCRS(1, 1), I, L, CFILF, ISTAT)
116 C DO 80 K=1, 10

```

```

117 C JOENT(K)=IDENT(K)

```

```

118 WRITE (6,3000) NOB
119 DO 90 I=1,NCB
120 IF (MOD(I,50) .EQ. 0) WRITE (6,3000) NOB
121 WRITE (6,3010) (INOB5(J,I),J=1,22)
122 90 CONTINUE
123
124 C DETERMINE THE LOWEST ALTITUDE IN THE LIST OF OBSERVED AND GRID
125 C POINTS.
126
127 120 Ihref=32000
128 DO 130 N=1,NOB
129 130 Ihref=MIN(Ihref,INCB5(3,N))
130 DO 140 I=1,IP
131 DO 140 J=1,JP
132 140 Ihref=MIN(Ihref,GRAPH(I,J))
133 C
134 C REFERENCE CEILING, MINIMUM BASE OF CLOUD, MAXIMUM TOP OF CLOUDS,
135 C AND THE CFDB LAYERS TO THE REFERENCE ALTITUDE, Ihref.
136 C
137 DO 190 N=1,NOB
138 DO 160 M=9,13
139 IF (INCB5(M,N) .EQ. MISS) GO TO 160
140 MGT=M-8
141 GO TO (145,160,150,150,160),MGT
142 145 ISYN=2
143 IF (INCB5(9,N) .LT. 0) ICYN=1
144 MTMP=IABS(INCB5(9,N))
145 MDS=MOD(MTMP,10)
146 MTMP=MTMP/10
147 INCB5(9,N)=(MTMP*10)+INCB5(3,N)-Ihref/10
148 IF (INCB5(9,N) .LT. 0) INCB5(9,N)=0
149 INCB5(9,N)=(10*INCB5(9,N)+MDS)*((-1)**ICYN)
150 GO TO 150
151 150 INCB5(M,N)=(10*INCB5(M,N))+INCB5(3,N)-Ihref/10
152 IF (INCB5(M,N) .LT. 0) INCB5(M,N)=0
153 160 CONTINUE
154 DO 170 M=14,22
155 MGT=M-13
156 LCOVR(MGT)=INCB5(M,N)
157 LCOVA(MGT)=MISS
158 170 Ihref=INCB5(3,N)

```



```

159 CALL MVLCOV(LCOVA,LCOVS,IRDEF,IRH)
160 GO 180 M=14,20
161 MCTEM=12
162
163 TNCRS(M,N)=LCOVA(MGT)
164
165
166 RANK OBSERVED WITHIN ORP, KY, OF A GIVEN OBS/REP. RESOLVE CONFLICT
167 ING INFORMATION IN THE SAME OBS ELEMENTS OF THE SEVERAL OBS/REP
168 ON THE BASIS OF RANK AND COMBINE NON CONFLICTING INFORMATION INTO
169 A BEST OBS/REP AT THE SITE OF THE GIVEN ORS/REP.
170
171 CALL COMORB(NOB,ORP,TIME,LSPILS)
172 MCTETASK=2
173 GO TO(200,210),MGT
174
175
176 COME HERE TO CREATE A NEW ORP
177
178 IENDETP
179 JREGEI
180 JENDEJP
181 GO TO 220
182
183 COME HERE TO UPDATE AN EXISTING CLOUD FOG DATA-PAFF.
184
185 IXOEXO
186 IRESEIXO/GRD+1
187 IXOEXO+XLN
188 IENDEIXO/GRD+1
189 IXOEXO(IXC,CRD)
190 IF(IXO .GT. 0) IENDEIXO+1
191 JYCEYO
192 JRESEJYC/GRD+1
193 JYCEYO+YLN
194 JENDEJYC/GRD+1
195 JYCEYCO(JYC,GRD)
196 IF(JYC .GT. 0) JENDEJENO+1
197 IF(IEND .GT. 10) TENDEIP
198 IF(JEND .GT. 10) JENDEJP
199 CALL CFMAP(IJEG,IEND,JBEG,JEND,DTST,TIME,ISSO,NCSO,MNR,RTIME,NOS)

```



```

200 C REFERENCE CREATED OR UPDATED CFB8 PARAMETERS TO GROUND LEVEL.
201
202 DO 280 I=IBF3,IBND
203 DO 280 J=JBEG,JBND
204 DO 250 M=1,6
205 IF(GRDPV(I,J,M) .EQ. MISS) GO TO 250
206 GO TO (250,230,250,240,240,250),M
207 ISYNE2
208 IF(GRDPV(I,J,2) .LT. 0) ISYNE1
209 MIMP=IABS(GRDPV(I,J,2))
210 GRDPV(I,J,2)=(MIMP*10)+IHPDF-GRDPH(I,J)/10
211 IF(GRDPV(I,J,2) .LT. 0) GRDPV(I,J,2)=0
212 GRDPV(I,J,2)=GRDPV(I,J,2)*((-1)**ISYN)
213 GO TO 250
214 GRDPV(I,J,M)=(GRDPV(I,J,M)*10)+IHPDF-GRDPH(I,J)/10
215 IF(GRDPV(I,J,M) .LT. 0) GRDPV(I,J,M)=0
216 CONTINUE
217 DO 260 M=1,15
218 MVM=6
219
220 LCOVA(MY)=GRDPV(I,J,M)
221 LCOVA(MY)=MISS
222 IHA=GRDPH(I,J)
223 CALL MVLCOV(LCOVA,LCOVA,LCOVA,IHA,IHPDF)
224 MVM=0
225 MIMP=0*(LCOVA(MY)+I)
226 IF(MIMP .NE. 1) GO TO 270
227 LCOVA(MY)=(LCOVA(MY)-1)
228 GRDPV(I,J,M)=LCOVA(MY)
229
230 C INSURE MINEED LESS THAN MAXTOP.
231
232 IF(GRDPV(I,J,5) .LT. GRDPV(I,J,4)) GRDPV(I,J,5)=GRDPV(I,J,4)
233
234 C INSURE THAT TOTAL SKY COVER NOT LESS THAN THE CLOUD COVER IN ANY
235 C LAYER.
236
237 DO 275 M=1,17
238 IF(GRDPV(I,J,M) .EQ. MISS) GO TO 275
239 MIMP=IABS(GRDPV(I,J,M))
240 GRDPV(I,J,1)=MAX0(GRDPV(I,J,1),MIMP)

```

001
 002
 003
 004
 005
 006
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CFAS*CFAS5(0).SF0INT
1 C SUPERQUINE SF0INT
2 C
3 C ROUTINE TO INTERPRET SURFACE OBS/REP IN FRAME OF CFAS PARAMETERS.
4 C
5 C SOURCES OF INPUT DATA ARE AVIATION WEATHER REPORTS IN AIRWAYS AND
6 C METAR CODES AND SURFACE SYNOPTIC REPORTS IN SYNOP CODE
7 C
8 C INPUT DATA
9 C
10 C IX = X DISTANCE OF OBS/REP SITE FROM IXPFF, HECTOMETERS
11 C IY = Y DISTANCE OF OBS/REP SITE FROM IYRFF, HECTOMETERS
12 C IZ = TERRAIN HEIGHT AT OBS/REP SITE, METERS
13 C ITIME = TIME OF OBS/REP
14 C ITYPE = TYPE OF OBS/REP
15 C
16 C 1=AIRWAYS -1 IF A SPECIAL
17 C 2=METAR -2 IF A SPECT (SPECIAL)
18 C 3=SYNOP
19 C
20 C IOD = WIND DIRECTION, 0-360 FROM TRUE NORTH
21 C IFF = WIND SPEED, METERS/SEC.
22 C IPPP = SEA LEVEL PRESSURE, MILLIBARS
23 C ITT = SURFACE TEMPERATURE, DEGREES KELVIN
24 C IYDE = SURFACE DEWPOINT, DEGREES KELVIN
25 C ITSC = TOTAL SKY COVER, 0-9 WMO CODE 2700
26 C IVIS = VISIBILITY-
27 C AIRWAYS - STATUTE MILES*100
28 C METAR - METERS
29 C SYNOP - WMO CODE 4377
30 C NWEA(J) = PRESENT WEATHER-- FROM 1 TO 7 ELEMENTS MAY BE INPUT
31 C AIRWAYS - CFAS CODE 1
32 C METAR - WMO CODE 4679
33 C SYNOP - WMO CODE 4677
34 C
35 C TPW = PAST WEATHER, 0-9 WMO CODE 4500
36 C NH = SKY COVER DUE TO LOW OR MIDDLE CLOUDS, 0-9 WMO CODE 2700
37 C ICL = LOW CLOUD TYPE, 0-9 WMO CODE 0513
38 C IH = HEIGHT ABOVE GROUND OF LOWEST CLOUD, 0-9 WMO CODE 1600
39 C ICM = MIDDLE CLOUD TYPE, 0-9 WMO CODE 0515

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37 C ICH = HIGH CLOUD TYPE, 1-9 WMO CODE 0555
 38 C NS(J) = SKY COVER DUE TO CLOUD LAYER - FROM 1 TO 10 LAYERS
 39 C AIRWAYS - CFAS CODE 2
 40 C METAR - WMO CODE 2700
 41 C SYNOP - WMO CODE 2700
 42 C TCIS(J) = TYPE OF CLOUD IN LAYER, 0-9 WMO CODE 0500
 43 C IHS(J) = HEIGHT OF BASE OF CLOUD LAYER
 44 C AIRWAYS - 100'S OF FEET
 45 C METAR - WMO CODE 1677
 46 C SYNOP - WMO CODE 1677
 47 C ITHN(J) = CLOUD LAYER THICKNESS INDICATOR
 48 C 1 IF THIN
 49 C MISSING IF NOT THIN
 50 C ICLG = CEILING DESIGNATOR - FIRST TWO DIGITS ARE THE INDFX NO. J OF
 51 C THE CEILING LAYER. THIRD DIGIT HAS A FOLLOWING MEANING
 52 C 1 = MEASURED
 53 C 2 = AIRCRAFT
 54 C 3 = BALLOON
 55 C 4 = RADAR
 56 C 5 = ESTIMATED
 57 C 6 = INDEFINITE
 58 C ICLGV = CHARACTERISTIC OF CEILING
 59 C MISSING = NOT VARIABLE
 60 C 1 = VARIABLE
 61 C IVISC = VISIBILITY CHARACTERISTICS
 62 C MISSING = NOT VARIABLE
 63 C 1 = VARIABLE
 64 C
 65 C CLOUD/FOG DATA BASE PARAMETERS
 66 C
 67 C IVALU = INFORMATION VALUE OF THE OBS/REP (11-10)
 68 C 0 INDICATES NO DATA USEABLE FOR DETERMINING ANY CFAS PARAMS.
 69 C 10 INDICATES AN OBS/REP WITH ALL NEEDED DATA PRESENT AND
 70 C USEABLE.
 71 C 1 TO 9 INDICATES AN OBS/REP WITH SOME MISSING CP NON-USEABLE
 72 C DATA.
 73 C NTCLC = TOTAL CLOUD COVER. (00 - 100)
 74 C NCEIL = HEIGHT OF CEILING LAYER (AGL), OF KAMETERS + TYPE OF CEILING

75 C DIGIT AS PER THIRD DIGIT OF ICLG. MINUS IF VARIABLE.
 76 C MINBAS = HEIGHT OF BASE OF LOWEST CLOUD (AGL), DEKAMETERS.
 77 C MAXTOP = HEIGHT OF THE TOP OF HIGHEST CLOUD (AGL), DEKAMETERS.
 78 C MCPWE = MOST SIGNIFICANT PRESENT WEATHER ELEMENT (NWS CODE 4577)
 79 C NVV = PREVAILING VISIBILITY AT SURFACE, METERS. NEGATIVE IF VARIABLE.
 80 C LCOV(9) = PERCENT CLOUD COVER IN THE CFD3 LAYERS
 81 C
 82 C DERIVED LAYERED CLOUD INFORMATION
 83 C
 84 C NUMLAY = NUMBER OF LAYERS GENERATED
 85 C KIND = KIND OF CLOUD LAYER
 86 C 1 = LOW
 87 C 2 = MIDDLE
 88 C 3 = HIGH
 89 C 4 = FOG
 90 C 5 = LOWEST CLOUD
 91 C 6 = CLEAR LAYER
 92 C ITHIN = THIN LAYER DESIGNATOR
 93 C MISSING = NOT THIN
 94 C 1 = THIN
 95 C COVER = CLOUD COVER IN LAYER (0.0 - 1.0)
 96 C BASE = HEIGHT OF THE BASE OF LAYER, FEET.
 97 C TOP = HEIGHT OF TOP OF CLOUD LAYER, FEET.
 98 C
 99 C MAP AND WINDOW DATA
 100 C
 101 C XPEFEAST-WEST UTM GRID COORDINATE OF LOWER LEFT HAND CORNER OF THE
 102 C WINDOW, KM.
 103 C YREF = NORTH-SOUTH UTM GRID COORDINATE OF LOWER LEFT HAND CORNER OF
 104 C THE WINDOW, KM.
 105 C CMRC = CENTRAL MERIDIAN OF WINDOW
 106 C
 107 C
 108 C COMMON /OBSREP/ IX,IY,IZ,ITIME,ICDD,ITYPE,IVALU,VCLO,NCCEL,NVV,
 109 C *MINBAS,MAXTOP,MCPWE,LCOV(9),ICL,ITDC,TCM,ICH,ICTS(10),NHEAT(7),IDW,
 110 C *LDD,IFF,IPPF,ITY,ITD,IVIS,WH,TH,NC(10),THE(10),ITH(10),ICLG,ICLBY
 111 C *TVISC,NOUSE(58)


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112 COMMON/CLCUDS/NUMLAY,KIND(10),ITHIN(15),COVER(10),BASEF(10),TOP(10)
113
114 DATA MISS/-32768/,FMISS/-32768./
115
116 COMMON/MAP/XREF,YREF,CMPD
117
118 DIMENSION CODE(10)
119
120 DATA CODE/82.,246.,492.,820.,1447.,2080.,4100.,5740.,7350.,-32768.
121
122
123
124 C TOPCLR=ASSUMED TOP OF ALL CLOUDS
125
126 TOPCLR=40000.
127
128
129 C INITIALIZE PARAMETERS
130
131 VALUED.
132 MTEIABS(I,TYPE)
133
134 C JUMP TO 493 IF OBS/REP TYPE IS NOT AN AIRWAYS, METAD OR SYNOP.
135
136 TRMT .GT. 3) GO TO 490
137 NUMLAYED
138 DO 10 I=1,10
139 KIND(I)=MISS
140 ITHIN(I)=MISS
141 COVER(I)=FMISS
142 BASE(I)=FMISS
143 TOP(I)=FMISS
144 NYCLCEMISS
145 NCEYLEMISS
146 MINBASEMISS
147 MAXTOPMISS
148 MOPWEE=1
149 AVWEMISS

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150 DO 20 I=1,3
151 20 LCOV(I)=MISS
152
153 C CALCULATE LATITUDE OF OBS/REP.
154
155 XUTM=IX
156 XUTM=(XREF+XUTM/10.)/100.
157 YUTM=IY
158 YUTM=(YREF+YUTM/10.)/100.
159 CALL BAKUTM(DLONG,DLAT,XUTM,YUTM,CMRAD)
160
161 C CONSTRUCT CLOUD LAYERS FROM LAYER CLOUD DATA IF PRESENT
162
163 IF(NS(I).GE.0) CALL LAYCLD(DLAT,VALU)
164
165 C CONVERT IH OF SYNOP CODE TO FEET
166
167 IF(IH.GT.8.OR.IH.LT.0) GO TO 111
168 HITLOW=CODE(IH+1)
169 GO TO 120
170 HITLOW=FMISS
171
172 C DETERMINE MOST SIGNIFICANT PRESENT WEATHER ELEMENT.
173
174 121 DO 130 IW=1,7
175 IF(NWEA(IW).LT.0) GO TO 128
176 IF(NWEA(IW).GT.99.AND.WT.NE.1) GO TO 128
177 NWEA=MOD(NWEA(IW),100)
178 MSPWE=MOD(MSPWE,100)
179 IF(MNWEA-MMSPW) 126,122,124
180 122 MSPWE=MAX0(NWEA(IW),MSPWE)
181 GO TO 126
182 MSPWE=NWEA(IW)
183 NWEA(IW)=MNWEA
184 GO TO 131
185 NWEA(IW)=MISS
186 130 MSPWE=MOD(MSPWE,100)
187

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188 C JUMP TO 165 IF VISIBILITY IS MISSING
189
190 IF(IVIS .LT. 0) GO TO 168
191
192 C CONVERT AIRWAYS AND SYNOP VISIBILITY CODES TO VISIBILITY IN METERS
193
194 GO TO (140,150,150).MY
195
196 C AIRWAYS CODE CONVERSION
197
198 14) VISE=IVIS
199 VISE=VISE*.16*.093
200 TVISE=VISE
201 GO TO 160
202
203 C SYNOP CODE CONVERSION
204
205 150 IF(IVIS .GT. 50) GO TO 162
206 IVISE=IVIS*.103
207 GO TO 160
208
209 152 IF(IVIS .GT. 30) GO TO 154
210 TVISE=(IVIS-50)*1.000
211 GO TO 150
212
213 154 IF(IVIS .LE. 89) GO TO 162
214 TVISE=VISE
215 GO TO 160
216
217 156 IVISE=32768/
218 NVV=IVIS
219
220 C MAKE NVV NEGATIVE IF VISIBILITY IS VARIABLE
221 IF(IVISC .EQ. 1) NVV=-NVV
222
223 C JUMP TO 170 IF THERE WAS NO LAYERED CLOUD DATA IN THE OBS/REP
224
225 165 IF(NUMLAY .EQ. 0) GO TO 170
226
227 C CHECK FOR FOG AND ESTIMATE PERCENTAGE CLOUD COVER AND TOPS OF

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226 C      CLOUD LAYERS FROM HORIZONTAL VISIBILITY AND TYPE OF FOG
227
228 CALL FOG(IVIS,NHEA,AMT,VALU)
229
230 C      JUMP IF LOWEST CLOUD HEIGHT IS MISSING
231
232 IF(HITLOW .EQ. FMISS) GO TO 230
233
234 C      CODE A 1/15 CLOUD COVER
235
236 NUMLAY=NUMLAY+1
237 KIND(NUMLAY)=F
238 COVER(NUMLAY)=D.0E25
239 BASE(NUMLAY)=HITLOW
240 GO TO 225
241
242 C      CALCULATE TOTAL SKY COVER FROM CODE IF NOT MISSING
243
244 IF(ITSC .LT. 0 .OR. ITSC .GT. 8) GO TO 180
245 CTOT=ITSC/8.
246
247 C      ASSURE LOW-MIDDLE CLOUD COVER NOT GREATER THAN TOTAL SKY COVER
248 WHEN TOTAL SKY COVER NOT MISSING OR OBSCURED
249
250 IF(NH .GT. ITSC .AND. NH .LE. 9) NHEITSC
251 GO TO 190
252 CTOT=FMISS
253
254 C      JUMP IF LOWEST CLOUD AMOUNT PRESENT
255
256 IF(NH .GE. 0 .AND. NH .LE. 3) GO TO 200
257 CLOW=FMISS
258 GO TO 210
259
260 C      TREAT OBSCURED LOWEST CLOUD AMOUNT AS OVERCAST
261
262 IF(NH .EQ. 9) NHE=8

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263 CLOW=NH/8.
264
265 C CHECK FOR FOG AND ESTIMATE PERCENTAGE CLOUD COVER AND TOPS OF
266 C CLOUD LAYERS FROM HORIZONTAL VISIBILITY AND TYPE OF FOG
267
268 210 CALL FOG(IVIS,NWEA,AMT,VALU)
269
270 C JUMP IF FOG COMPLETELY COVERS SKY
271
272 IF(NUMLAY .GT. 0 .AND. AMT .GT. .99) GO TO 225
273
274 C CONSTRUCT CLOUD LAYERS FROM MANDATORY SYNOP TYPE DATA
275
276 IF(ICL .GT. 9) ICL=MISS
277 IF(ICM .GT. 9) ICM=MISS
278 IF(ICH .GT. 9) ICH=MISS
279 CALL SYNOP(CTOT,CLOW,HITLOW,ICL,ICM,ICH,NWEA,DLAT,VAL,MSPNE)
280 VALU=(VALU+VAL)/2.
281
282 C IF NO LAYERED CLOUD INFORMATION OBTAINABLE FROM OBS/REP, JUMP TO
283 C 490
284
285 220 IF(NUMLAY .EQ. 0) GO TO 490
286
287 C JUMP IF LOWEST CLOUD BASE IS MISSING
288
289 225 IF(HITLOW .LE. 0) GO TO 300
290
291 C DETERMINE LOCATION OF THE LOWEST CLOUD
292
293 DO 230 LNQ=1,NUMLAY
294 IF(KIND(LNO) .EQ. 5) GO TO 240
295 CONTINUE
296
297 C DETERMINE CLOUD COVER FOR LOWEST BASE.
298
299 240 DO 260 LNY=1,NUMLAY
TF(KIND(LNX) .EQ. 1) GO TO 250

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300 IF(KIND(LNX) .NE. 2) GO TO 260
301 CLDINT=-0.0714285714 + 1.07142857*COVER(LNX)
302 COVER(LNX)=AMAX1(CLDINT,0,.0525)
303 GO TO 300
304 CONTINUE
305
306 C DETERMINE CLOUD TOPS
307
308 300 ELEV=IZ*3.2908
309
310 CALL TOPS(ELEV,NWEA,DLAT)
311
312 C LOWER THE HEIGHTS OF THE TOPS OF LAYERS DESIGNATED AS THIN
313
314 DO 320 LNX=1,NUMLAY
315 LTYPE=KIND(LNX)
316 GO TO (310,310,320,320,320,320),LTYPE
317 IF(Ithin(LNX) .NE. 1) GO TO 320
318 TOP(LNX)=BASE(LNX) + 0.5*(TOP(LNX)-BASE(LNX))
319
320 CONTINUE
321
322 C DETERMINE MINBAS AND MAXTOP OF CLOUDS
323 BASINT=TOPCLR
324 TOPINT=0.
325
326 DO 340 LNX=1,NUMLAY
327 LTYPE=KIND(LNX)
328 IF(LTYPE .EQ. 6) GO TO 340
329 IF(COVER(LNX) .GE. .025) GO TO 330
330 COVER(LNX)=0.05
331 BASINT=AMIN1(BASINT,BASE(LNX))
332 TOPINT=AMAX1(TOPINT,TOPI(LNX))
333 CONTINUE
334 MINBAS=BASE(LNX)*.03048 + .5
335 MAXTOP=TOPINT*.03048 + .5
336
337 C INSURE THAT THE MAXIMUM TOP OF CLOUDS IS AT LEAST EQUAL TO MINIMUM
    C BASE OF CLOUDS.

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338 TF (MAXTOP .LT. MINBAS) MAXTOP=MINBAS
339
340
341
342 DETERMINE PERCENT CLOUD COVER IN THE CFDB LAYERS AND IDENTIFY
343 LAYERS CONTAINING CLOUDS OBSERVED TO BE THIN
344
345 DO 440 JM=1,4
346 DO 430 LNX=1,NUMLAY
347 LTYPE=KIND(LNX)
348 GO TO (360,370,380,390),JM
349 IF(LTYP .EQ. 6) GO TO 400
350 GO TO 430
351 IF(LTYP .EQ. 5) GO TO 400
352 GO TO 430
353 IF(LTYP .EQ. 4) GO TO 400
354 GO TO 430
355 IF(LTYP .LE. 3) GO TO 400
356 GO TO 430
357 NTBASE=BASE(LNX)
358 NNTOP=TOP(LNX)
359 CALCULATE PERCENT CLOUD COVER TO NEAREST F PERCENT
360
361 NAMECOVER(LNX)=100. + 2.5
362 NAMEIABS(NAME-MOD(NAME,5))
363 IF(NAME .EQ. 0 .AND. KIND(LNX) .NE. 6) GO TO 430
364
365 IF OBS/REF INDICATED A THIN CLOUD, CODE LAYER WITH # THIN DESTG.
366
367 IF(IITHIN(LNX) .NE. 1) GO TO 410
368 NAME=NAME+1
369
370 DETERMINE INDEX NOS. OF LOWEST AND HIGHEST CFDB LAYERS INFLUENCED
371 BY CLOUD LAYER NO. LNX
372
373 410 CALL CFLAY(NTRBASE,NNTOP,NTBASE,NNTOP)
374

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375 IF(NTPASE .EQ. 0) GO TO 420
376
377 C CODE THE AFFECTED CFOR LAYERS WITH THE PERCENT CLOUD COVER IN
378 C CLOUD LAYER NO. LNX
379
380 DO 420 LAY=NTBASE,NTTOP
381 LCOV(LAY)=NAMT
382 CONTINUE
383
384
385 IF(IITSC .LT. 0 .OR. IITSC .GT. 9) GO TO 450
386
387 IF(IITSC .EQ. 9) IITSC=8
388
389 NTCLC=100.0*(AMT + (1.-AMT)*IITSC/8.0) + C.F
390 GO TO 460
391
392 C JUMP TO 460 IF NOT A SYNOP TYPE OBS/REP OR TOTAL SKY COVER WAS
393 C NOT MISSING IF A SYNOP TYPE OBS/REP
394
395
396
397 C REDUCE VALU TO 5. WHEN TOTAL SKY COVER IS MISSING
398
399 IF(VALU .GT. 5.0) VALU=5.
400
401 C JUMP TO 480 IF NO CEILING LAYER
402
403 IF(ICLS .LT. 0) GO TO 480
404 LSC=ICLG/10
405 CEILH=IHS(LSC)*100
406 IF(MY .EQ. 1) GO TO 470
407 IF(IHS(LSC) .LE. 50) GO TO 470
408 CEILH=(IHS(LSC)-50)*1000
409 IF(IHS(LSC) .LE. 80) GO TO 470
410 CEILH=35000. - (13000./90.)*ABS(OLAT)
411 NCEIL=CEILH*.03048
412 NCEIL=ID*NCEIL + MOD(ICLG,10)

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413 IF(ICLSV .EQ. 1) NCEIL=-NCEIL
414
415 IVALUE=VALU
416 IF (MSPWE .EQ. -1) MSPWE=0
417 RETURN
418 IF(INV .EQ. MISS) GO TO 500
419 VALU=1.
420 IF(MSPWE .EQ. -1) GO TO 480
421 IVALUE=VALU+1.
422 GO TO 480
423 END
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1PAGE

DATA STATEMENT

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1  C SHAD - MAIN PROGRAM FOR DELINEATING AREAS OF DIFFERING VALUES OF
2  C SKYCOVER, CEILING AND VISIBILITY BY DIFFERING SHADES OF
3  C GRAY.
4
5  C INTEGER COOPV
6
7  C DIMENSION PARAM(15),IVAL(12),LABEL(10),LXAB(14),LYAB(7),IJDENS(9)
8
9  C COMMON /COORD/COORDY(20,20),KWCAL(100)
10 C COMMON /ALPHA/PARAM
11
12 C DATA PARAM/'KRYCOV','CEILNG','VISIBL','CLOUDPT','CLDPTOP','WEATHR',
13 C 'LAYCOV','LAY2CV','LAY3CV','LAY4CV','LAY5CV','LAY6CV','LAY7CV',
14 C 'LAY8CV','LAY9CV',
15 C DATA LXAB/0.5M 'SHREL X',5M(1M) '5.0M
16 C DATA LYAB/3.0M 'PHREL Y',5M(1M) '5.0M
17 C DATA NCHT/37,NCHY/34,NCHY/42/
18 C DATA KWEA/10.0,2.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,
19 C '5.0,0.0/
20 C XMINED.
21 C XMAXEDD.
22 C YMINED.
23 C YMAXEDD.
24 C NCHTSC.
25 C READ (5,1000) NBLCK
26 C WRITE (6,1000) NBLCK
27 C READ (5,1000) IX,IJDENS(1),ZEL,IKI
28 C WRITE (6,1000) IX,IJDENS(1),ZEL,IKI
29 C READ (5,1000) IZ,IJDENS(1),ZEL,IKI
30 C WRITE (6,1000) IZ,IJDENS(1),ZEL,IKI
31 C NCVETV
32 C IVAL(1)D.
33 C IVAL(2)D.
34 C IVAL(3)D.
35 C IVAL(4)D.
36 C IVAL(5)D.
37 C IVAL(6)D.
38 C IVAL(7)D.
39 C IVAL(8)D.
40 C IVAL(9)D.
41 C IVAL(10)D.
42 C IVAL(11)D.
43 C IVAL(12)D.
44 C IVAL(13)D.
45 C IVAL(14)D.
46 C IVAL(15)D.
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125 C IVAL(94)D.
126 C IVAL(95)D.
127 C IVAL(96)D.
128 C IVAL(97)D.
129 C IVAL(98)D.
130 C IVAL(99)D.
131 C IVAL(100)D.

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41 WRITE (5,1010) (PVAL(I),I=1,NOV)
42 CALL CERRP(NOV,PVAL,NPDM)
43 CALL CUMM10(YMIN,XMAX,YMIN,YMAX,X,NOV,LABEL,NCHT,LXAB,NCHX,LYAB,NCHY
44 * ,TJDEMT,NPDM,PVAL)
45 GO TO 10
46 END
```