U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE
SYSTEMS DEVELOPMENT OFFICE
TECHNIQUES DEVELOPMENT LABORATORY

TDL Office Note 73-5

THE TDL MOS DEVELOPMENT SYSTEM
CDC 6600 VERSION

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October 1973

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I. INTRODUCTION

Model Output Statistics (MOS) is a technique in which a predictand is related statistically to predictors which are themselves forecasts (or output) from numerical models. This technique was conceived and planning began for its use in connection with the development of the Subsynoptic Advection Model (SAM) (Glahn and Lowry, 1972) in 1965. Since that time, two sets of MOS processing programs have been used, one in connection with SAM and PE (the NMC 6-level primitive equation model, Shuman and Hovermale, 1968) data and the other with PE and trajectory (Reap's (1972) trajectory model) data--the so-called PEATMOS system.

As other models were developed, it became clear that we needed a more general system which would accept data, and allow the merging of data, from several models. It would have to be flexible enough so that output from new models, as they are developed, could be accommodated. Planning for this new system started in March 1972. Although changes will always be necessary in any set of computer programs that must meet the changing needsof an organization, the MOS Development System is now complete enough so that it can be effectively used. Its development has been a joint effort of many people in TDL and several have actively contributed to the programming. In this latter group I want especially to mention Frank Globokar, George Hollenbaugh, Frank Lewis, Ron Reap, and Tom Grayson.

II. THE TDL LIBRARY

An integral part of, but not limited to, the MOS System is the TDL library of programs TDLLIB. This system, used through CDC 6600 SELECT subroutine, was established by Tom Grayson and is now maintained by George Hollenbaugh. On this library reside most of the programs used in the MOS Development System. This library is kept current and reflects changes in programs which may constitute improvements in efficiency or utility or the correction of errors. Therefore, maximum use should be made of TDLLIB in preference to use of program decks.

Use of TDLLIB is fully explained in a series of TDL Library Notices. In its simplest form, SELECT will complete all external linkages required from the LGO file which exist on TDLLIB. TDLLIB is maintained on permanent files on A and C machines. In addition, two backup tapes are maintained, one for use at FOB #4 (E8800) and one for use at the MURDC site (E4490)

Source language of all programs on TDLLIB is Fortran Extended except for a few specialized assembly language subroutines.

A useful control card sequence, which will use the backing tape if the permanent file can't be found, is:

```
JOB CARD
 .
 .
 .
RFL,1200.
ATTACH(LIB,W42TDLLIB,CY51)
JUMP,1.
EXIT.
RFL,100.
REQUEST,TAPE.              E8800(P)
SELECT(BM,I=LIB,L=TAPE)
RETURN(TAPE)
PASS,1.
RFL,60000.
FTN(R=3,A)
SELECT
 .
 .
 .
LGO
 .
 .
 .
```

III. FUNCTIONS OF THE DEVELOPMENT SYSTEM

The basic programs and data flow within the System are depicted in Fig. III-1. Each box represents a main program or a subroutine for which there is a main program driver. Each program operates on input data and usually supplies data for another program; this data flow is represented by arrows. Each box also shows the person or persons primarily responsible for that program; in most instances the first person listed wrote the program. The name of the program is indicated, if it conforms to the MOS system naming convention. The program is on the TDLLIB unless the name appears in parenthesis. The names of all MOS programs start with the letter M and the following numbers fall in the ranges indicated in Fig. III-2. The number in the lower left corner of each box in Fig. III-1 is for reference in the following sections.

A "MOS Tapes Notebook" is maintained by George Hollenbaugh which contains tape formats and the identification of tapes and data for MOS System users. Tape formats are also described in this Note. All tapes used in the MOS System are 7-track 800 bpi (except the PEATMOS tapes are 556 bpi--see Format of PEATMOS Grid-Point Predictor Tapes).

Archive Forecasts (Boxes 1-5)

Basic Forecast Fields from various numerical models are saved in grid-point form on special TDL grids. Each model run usually produces a separate tape. The tape format and grids are explained in Section IV of this Note. Data in this format have been archived since October 1, 1972.

Merged Grid-Point Tapes (Boxes 11-15)

The daily tapes are merged so that each model forms a separate data collection. All run times for a particular model are put on one tape. These are the basic grid-point predictor tapes available for use. The tape numbers and corresponding dates for which data exist are maintained in the MOS Tapes Notebook.

Interpolate (Boxes 21-25)

A separate version of the subroutine M200 exists for each model data collection. A driver DRM200 is available in source language. Interpolation into the grid-point fields is made for specific points, usually, but not limited to, station locations designated by the National Weather Records Center WBAN numbers. The tape format is contained in Section V of this Note.

Merge Interpolated Tapes (Box 30)

If it is desired to merge data from more than one model, M300 should be used. It will properly intersperse data from two input tapes and produce a merged interpolated tape in the same format as the input tapes. If data from more than two models are to be merged, more than one run of M300 will be necessary. For data collected in the MOS format (starting Oct. 1, 1972) M200, and M300 if needed, produces predictor tapes in the format needed by M600 regression and other analysis programs. The points for which interpolated data are provided should be the same on the two tapes to be merged.

MOS DEVELOPMENT SYSTEM

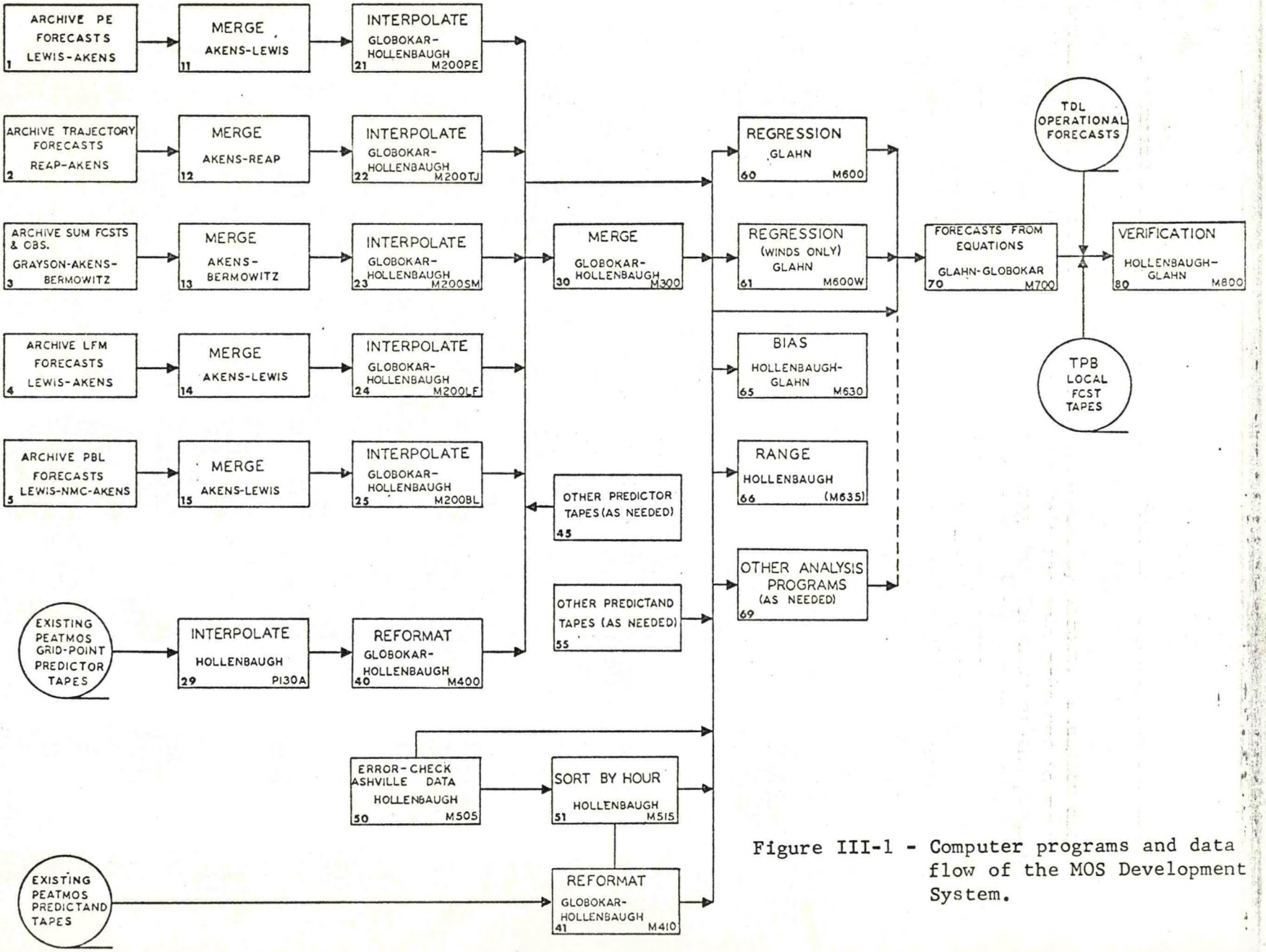


Figure III-1 - Computer programs and data flow of the MOS Development System.

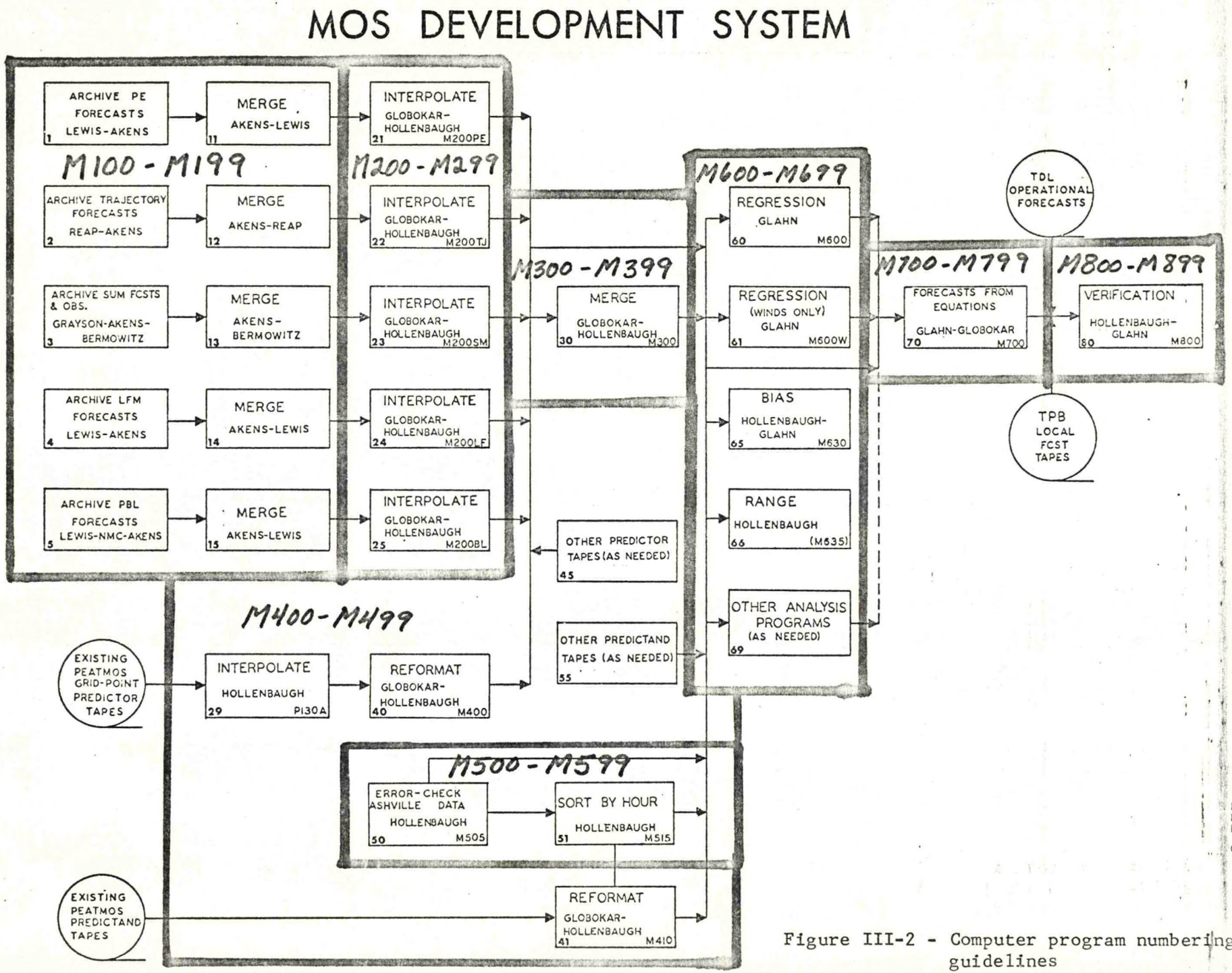


Figure III-2 - Computer program numbering guidelines

III-3

Interpolate (PEATMOS) (Box 29)

Data from the PE and Trajectory (TJ) models were collected in the so-called PEATMOS format from July 3, 1969 through October 31, 1972. Data from both models were put together on a tape, but the 0000 and 1200 GMT runs were kept separate. The format is described in Section IV of this Note.

Program P130A performs the same function for the PEATMOS tapes as M200 does for the MOS tapes--it interpolates to specific locations. The output, provided in the format used by the D140 and D140W regression programs, must be reformatted for use in the MOS system.

Reformat Predictors (Box 40)

Program M400 reformats the output from P130A into that produced by M200. Output from M400 can be used for input to M600 regression and other analysis programs.

Other Predictor Tapes (Box 45)

It may be that a user will want to provide predictors other than those contained on, or those that can be computed from, our archived tapes. If so, he need only prepare these predictors in the same format as that produced by M200. M300 will then merge them with predictors from the numerical models for input to analysis programs.

Error Check Asheville Data (Box 50)

Three-hourly observations for 255 U.S. stations are received monthly from the National Weather Records Center (NWRC) at Asheville. The format is explained in Section VI of this note. These data then undergo a careful automatic-manual check for correctness. The program used to flag errors, etc., and to put the data into the format (described in Section VII) needed by the MOS analysis programs is M505.

Sort by Hour (Box 51)

Output of M505 contains 8 observations/day. For most purposes, only one hour, say 0600 GMT, will be needed by a program for a particular run; occasionally, two hours might be needed. M515 will prepare a tape consisting of data from either one or two observational hours. Error-free tapes from M505 and M515 are maintained by George Hollenbaugh and the tape numbers are kept in the MOS Tapes Notebook. Individual users should not need to use M505 or M515, but can if they so desire.

Reformat Predictands (Box 41)

Existing PEATMOS predictand tapes are reformatted for MOS system by M410. This reformatting has already been done and error-free tapes are maintained by George Hollenbaugh. Individual users should not neet to use M410.

Other Predictand Tapes (Box 55)

It may be that a user will want to provide predictands other than those contained on, or that can be computed from, our archived tapes. If so, he need only prepare these predictands in the same format as that produced by M505, M515, and M410. As specified in Section VII, the dimensions of the predictand data matrix are adjustable. However, there are restrictions concerning the range of variables and also restrictions in analysis programs such as M600 as to the maximum matrix size allowed. Users should check with Bob Glahn before using this option.

Regresion (Box 60)

M600 is our major analysis program and produces regression equations on paper and, if desired, on cards and/or magnetic tape. Predictors are screened and can be continuous, binary, or computed by subroutine; they can be from the predictand tape as well as from the predictor tape. Predictands can be continuous, binary, or computed by subroutine. Equations can be single station or generalized operator.

Regression (Box 61)

M600W is a slightly different version of the screening program M600. It produces equations simultaneously for the U-wind component, V-wind component, and wind speed. The selected predictor set is the same in all three equations.

Bias (Box 65)

M630 stratifies a sample based on a predictor value and computes the relative frequency of a binary predictand on that stratified sample. It is used primarily in selecting areas over which to develop regionalized (generalized operator) equations.

Range (Box 66)

M635 computes the maximum and minimum values which a regression equation with only binary predictors can produce.

Other Analysis Programs (Box 69)

A user may want to provide another analysis program. If so, the routines provided for reading the predictor and predictand tapes should be used: RDX, RDY1, RDY2, RDY3, RDXY, RDXY1, and YUNPKR.

Forecasts From Equations (Box 70)

M700 accepts equations from cards or tape in the format prepared by M600 and produces forecasts using the MOS predictor tapes. If desired, verifying observational data are matched with the forecasts in preparation for verification.

Verification (Box 80)

This is the only program within the MOS system not yet operational. At the present time, users wishing to verify the forecasts prepared by M700 must provide their own verification program. However, note that the verifying observations have already been taken from the predictand tape by M700, if desired.

Eventually a program, M800, will be provided which will allow comparative verification with certain local forecasts available from the Technical Procedures Branch, OMO.

IV. GRID-POINT PREDICTOR TAPES

The grids on which the basic forecast and analysis fields are saved, the lists of fields saved for each model, and the format of the grid-point tapes are given in this section. The specific dates for which data from a particular model are available are given in the MOS Tapes Notebook.

Format of MOS Grid-Point Predictor Tapes

A - Multiple files (one per model run), each having multiple records consisting of:

Words 1-5: Standard NMC 5-word identifier (see NMC Office Note 28).

Words 6-NPKWDS: Packed grid-point data, 12 bits per word. (Some hourly observations are provided for. See "SUM Data Collection.")

Grid-point data are packed by the NMC routine W3AI00. The first packed datum is in the leftmost 12 bits of the 60 bit word, etc. The first datum packed is the lower left grid-point value. Skanning of the grid is then by column (upward) from left to right.

B - Double EOF indicates end of data on tape

COMMENTS: A "Collection" of tapes contains data (initial fields and/or forecasts) from one numerical model (for instance, the PE) for all of its run times (for instance, 0000Z and 1200Z for the PE) for any number of dates in sequence. Each Collection has its own number of words per record, NPKWDS; this will remain constant throughout the period of collection. The data are not (necessarily) separated by month or season; a tape contains as many cases as possible. The standard NMC units are used for the variables wherever possible. A missing value is indicated by all 12 bits set to 1.

I/O MODE: These are 7-track tapes written in 800 bpi density with the unformatted FORTRAN WRITE statement with the S-Tape driver. (Use the request card REQUEST,TAPEX,S.) Tests (May 1972) indicate that the automatic buffering provided by FORTRAN is very desirable for the short, 71-word record PE collection in terms of the number of PP calls and PP time required and is still advantageous in those terms for the longer, 509-word record SUM collection. The S-driver is better than the I-driver (Scope Internal) for this purpose and is comparable to the L-driver.

PE Data Collection

Initial and forecast fields from the NMC hemispheric 6-layer Primitive Equation (PE) model are archived over the 4 grids shown in Figure IV-1. The four grids, numbered 1 through 4, cover the "lower 48" states, Alaska, Hawaii, and Puerto Rico respectively. Data for a total of 327 grid points are saved. The tape format is given in "Format of MOS Grid-Point Predictor Tapes." The packed data plus the five identifiers require a record size of 71 words.

The PE fields being saved (194 at 0000 GMT, 125 at 1200 GMT) are listed in the table below. The order of these fields may not remain constant throughout the collection period except that all t_o +6 hour fields will preceed all t_o +12 hour fields, etc. Period of record is October 1, 1972 to present.

VARIABLES SAVED FROM 6-LAYER FULL-MESH PE

Variable	Units	Forecast Interval t_o + 0	6	12	18	24	30	36	42	48*
1000 MB HEIGHT	M		X	X	X	X		X		X
850 MB HEIGHT	M		X	X	X	X		X		X
500 MB HEIGHT	M		X	X	X	X		X		X
1000 MB TEMP.	DEG K			X		X		X		X
850 MB TEMP.	DEG K		X	X	X	X		X		X
700 MB TEMP.	DEG K			X		X		X		X
500 MB TEMP.	DEG K			X		X		X		X
B.L. POT. TEMP.	DEG K		X	X	X	X		X		X
SURFACE PRESS. (p*)	MB			X		X		X		X
B.L. U	M/SEC.		X	X	X	X		X		X
B.L. V	M/SEC		X	X	X	X		X		X
B.L. ω	MB/SEC		X	X	X	X		X		X
REL. HUM. (SFC-490)	PERCENT		X	X	X	X	X	X	X	X
(REL. HUM.) B.L.	PERCENT		X	X	X	X		X		X
(REL. HUM.)1	PERCENT		X	X	X	X		X		X
(REL. HUM.)2	PERCENT		X	X	X	X		X		X
PRECIP. WATER	KG/M^2			X		X		X		X
PRECIP. AMT.	M			X	X	X	X	X	X	X
850 MB U	M/SEC			X		X		X		X
850 MB V	M/SEC			X		X		X		X
700 MB U	M/SEC					X				
700 MB V	M/SEC					X				
500 MB U	M/SEC					X				
500 MB V	M/SEC					X				
850 MB ω	MB/SEC			X		X		X		X
650 MB ω	MB/SEC			X		X		X		X
p** (TROPOPAUSE PRESSURE)	MB			X		X		X		X

B.L. ≡ Lowest 50 mb;
Layer 1 ≡ B.L. top to ~ 720 mb;
Layer 2 ≡ ~ 720 to ~ 490 mb.

*00 GMT runs include predictions at t_o +60, t_o +72 and t_o +84. (Same predictors as at t_o +48.)

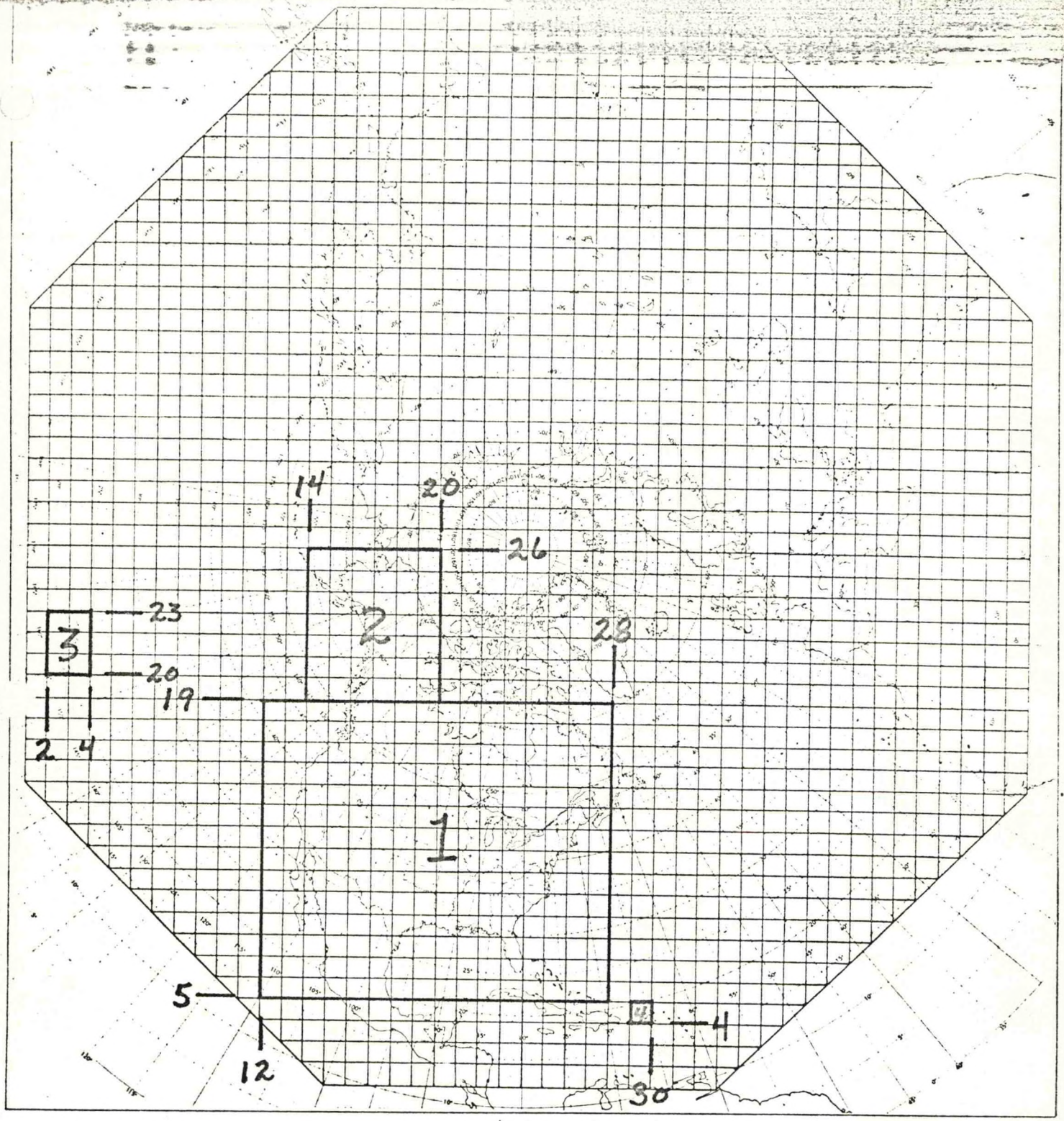


Figure IV-1.--Grids on which PE data are collected for the MOS System.

TRAJ Data Collection

Initial and forecast fields from the TDL Trajectory (TRAJ) model are archived over the grid shown in Figure IV-2. Data for 221 grid points are saved. The tape format is given in "Format of MOS Grid-Point Predictor Tapes." The packed data plus the five identifiers require a record size of 50 words.

There are 22 TRAJ fields being saved at t_o +24 (only). In addition, 9 PE fields are being saved on the TRAJ grid at t_o +24. The names of the fields and the order in which they will appear on the tapes are shown below. Period of record is October 1, 1972 to present.

VARIABLES SAVED FROM TRAJECTORY MODEL

Variable	Units
SURFACE TEMPERATURE	DEG K
SURFACE DEW POINT	DEG K
850 MB TEMPERATURE	DEG K
850 MB DEW POINT	DEG K
700 MB TEMPERATURE	DEG K
700 MB DEW POINT	DEG K
SFC REL. HUMID.	PERCENT
850 MB REL. HUMID.	PERCENT
700 MB REL. HUMID.	PERCENT
700-SFC MEAN REL. HUMID.	PERCENT
SFC 12-HR NET VERT. DISPL.	MB
850 MB 12-HR NET VERT. DISPL.	MB
700 MB 12-HR NET VERT. DISPL.	MB
SFC 24-HR NET VERT. DISPL.	MB
850 MB 24-HR NET VERT. DISPL.	MB
700 MB 24-HR NET VERT. DISPL.	MB
700-SFC CNVCTV. INSTAB.	DEG K
SFC 12-HR PRECIP. AMT. (12-24 HR)	M
SFC 12-HR HORIZ. CVGNC.	SEC^{-1}
850 MB 12-HR HORIZ. CVGNC.	SEC^{-1}
K INDEX	(DIMENSIONLESS)
TOTAL TOTALS INDEX	(DIMENSIONLESS)

REDUNDANT FIELDS FROM FULL-MESH PE:

VARIABLE	UNITS
500 MB TEMPERATURE	DEG K
B.L. U	M/SEC
B.L. V	M/SEC
850 MB U	M/SEC
850 MB V	M/SEC
700 MB U	M/SEC
700 MB V	M/SEC
500 MB U	M/SEC
500 MB V	M/SEC

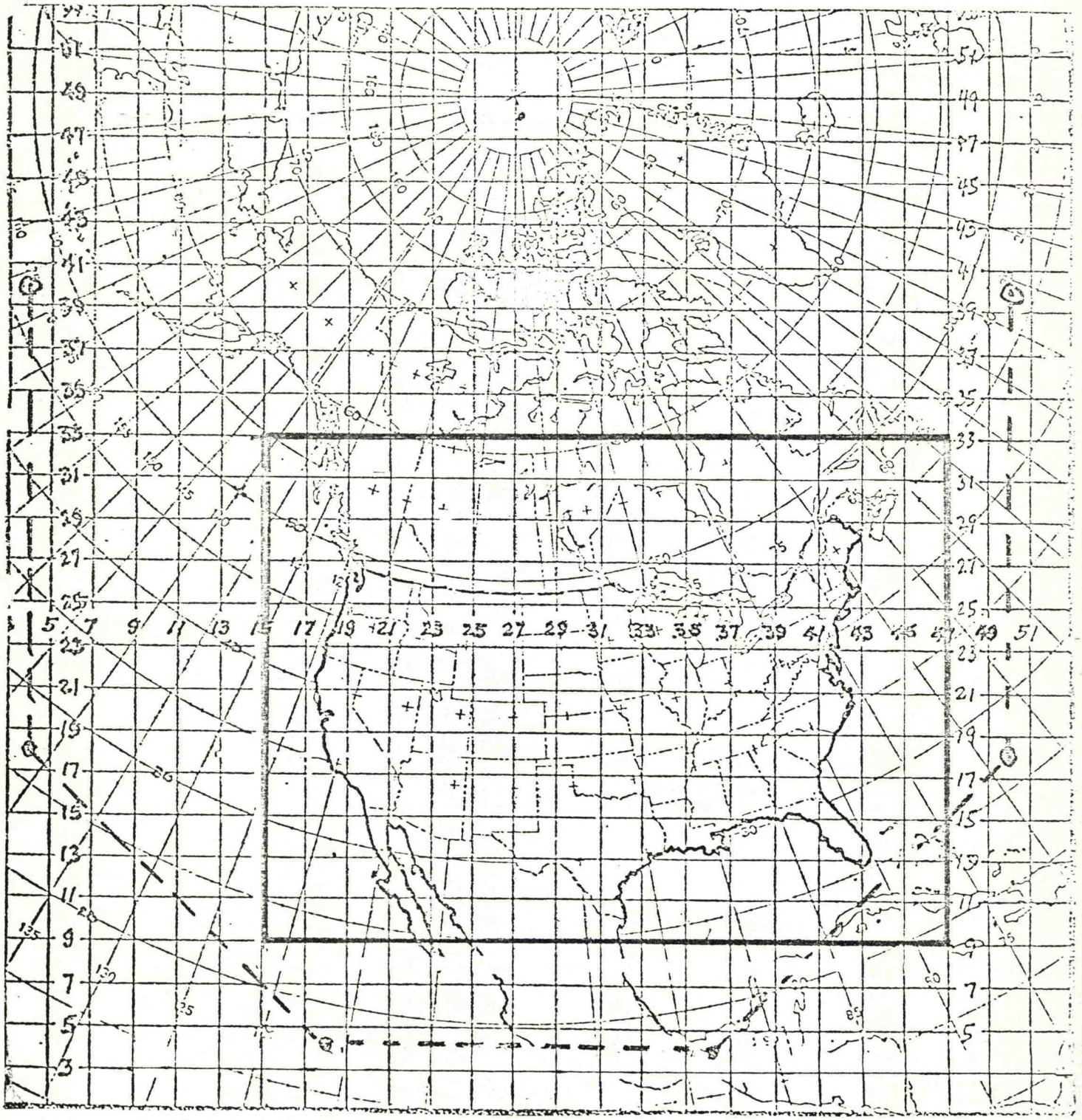


Figure IV-2. Grid on which TRAJ data are collected for the MOS System is shown with the LFM grid as a background.

LFM Data Collection

Initial and forecast fields from the NMC Limited-Area Fine-Mesh Model (LFM) are archived over the grid shown in Figure IV-3. Data for a total of 744 grid points are saved. The tape format is given in "Format of MOS Grid-Point Predictor Tapes." The packed data plus the five identifiers require a record size of 154 words.

The120 LFM fields being saved are shown in the table below. The order of these fields may not remain constant throughout the collection period except that all t_o +0 hour fields will preceed all t_o +6 hour fields, etc. Period of record is October 1, 1972 to present.

VARIABLES SAVED FROM LFM

Variable	Units	Forecast Interval t_o + 0	6	12	18	24
(REL. HUM.) SFC-490	PERCENT		X	X	X	X
PRECIP. WATER	KG/M^2		X	X	X	X
B.L. POT. TEMP.	DEG K		X	X	X	X
B.L. U	M/SEC		X	X	X	X
B.L. V	M/SEC		X	X	X	X
1000 MB HEIGHT	M	X	X	X	X	X
850 MB HEIGHT	M	X	X	X	X	X
700 MB HEIGHT	M	X	X	X	X	X
500 MB HEIGHT	M	X	X	X	X	X
1000 MB TEMP.	DEG K	X(SFC)		X		X
850 MB TEMP.	DEG K	X	X	X	X	X
700 MB TEMP.	DEG K	X		X		X
500 MB TEMP.	DEG K	X		X		X
850 MB U	M/SEC		X	X	X	X
700 MB U	M/SEC			X		X
500 MB U	M/SEC			X		X
200 MB U	M/SEC			X		X
850 MB V	M/SEC		X	X	X	X
700 MB V	M/SEC			X		X
500 MB V	M/SEC			X		X
200 MB V	M/SEC			X		X
850 MB ω	MB/SEC			X		X
700 MB ω	MB/SEC			X		X
500 MB ω	MB/SEC		X	X	X	X
PRECIP. AMT.	M		X	X	X	X
SURFACE PRESS. (p*)	MB			X		X
(REL. HUM.)B.L.	PERCENT	X	X	X	X	X
(REL. HUM.)1	PERCENT	X	X	X	X	X
(REL. HUM.)2	PERCENT	X	X	X	X	X
1000 MB DEW POINT	DEG K		X	X	X	X
850 MB DEW POINT	DEG K			X		X
700 MB DEW POINT	DEG K			X		X
500 MB DEW POINT	DEG K			X		X
SEA LEVEL PRESS.	MB	X		X		X
B.L. ω	MB/SEC		X	X	X	X

B.L. ≡ Lowest 50 Mb; Layer 1 ≡ B.L. top to ~ 720 Mb; Layer 2 ~ 720 to 490 Mb.

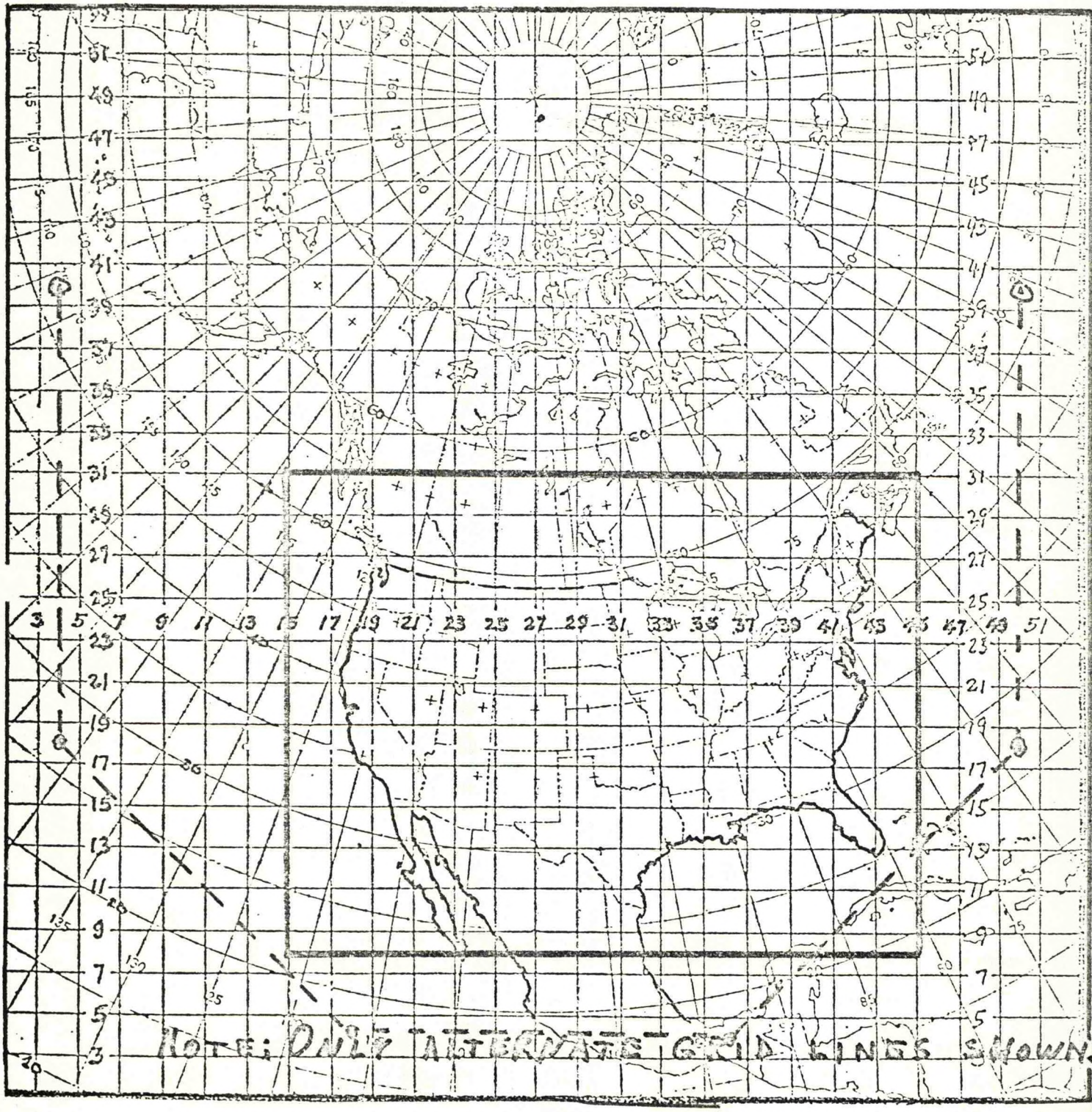


Figure IV-3--Grid on which LFM data are collected for the MOS System.

PBL Data Collection

Initial and forecast fields from the NMC Planetary Boundary Layer (PBL) model are archived over the same grid used for the LFM shown in Figure IV-3. Data for a total of 744 grid points are saved. However, data for the two leftmost columns are not actually available from the model, and the values given to these two columns are the same as those of column three. This insures that interpolation can still be performed within the entire grid, but values at the extreme left will be less accurate. The packed data plus the five identifiers require a record size of 154 words.

The 46 PBL fields being saved at each of the 7 times t_o, t_o +3, t_o +6, t_o +9, t_o +12, t_o +18, and t_o +24 (total of 322 fields) are shown in the table below. The order of these fields may not remain constant throughout the period of collection except that all t_o +0 hour fields will preceed all t_o +3 hour fields, etc. Period of record is from about October 1, 1972 to present.

VARIABLES SAVED FROM PBL

Variable	Units	Elevation above ground (M)							
		0	50	150	300	600	900	1200	1600
U COMPONENT OF THE WIND	CM/SEC		X	X	X	X	X	X	X
V COMPONENT OF THE WIND	CM/SEC		X	X	X	X	X	X	X
SPECIFIC MOISTURE	(DIMENSIONLESS)		X	X	X	X		X	
FRICTIONALLY - INDUCED VERTICAL VELOCITY	CM/SEC		X	X	X	X		X	
TERRAIN - INDUCED VERTICAL VELOCITY	CM/SEC		X	X	X	X		X	
SPECIFIC HUMIDITY	(DIMENSIONLESS)	X	X	X	X	X	X	X	X
TEMPERATURE	DEG K	X	X	X	X	X	X	X	X
RATIO OF SURFACE WIND TO 50M WIND	(DIMENSIONLESS)	X							

Specific moisture is liquid water condensed by the model but not allowed to fall as rain. The direction of the surface wind is the same as the direction of the 50m wind; thus, surface wind components may be determined from variables 1, 2 and 8. Vertical velocity is the sum of terms 4 and 5.

Initial and forecast fields from the TDL Subsynoptic Update Model (SUM) are archived over the grid shown in Figure IV-4. Data for a total of 2520 grid points are saved. The packed data plus the five identifiers require a record size of 510 words. (An extra word is required by W3AI00 for checksum when number of points is evenly divisible by 5.) All t_o+ 0 fields preceed t_o+3 fields, etc. Period of record is about October 1, 1973 to present.

VARIABLES SAVED FROM SUM

Variable	Units	Forecast Interval* t_o+ 0	3	6	9	12	15	18
1000 MB HEIGHT	M	X	X	X	X	X	X	X
MEAN REL. HUM. (1000-500)	PERCENT	X	X	X	X	X	X	X
MEAN SP. HUM. (1000-500)	DIMENSIONLESS	X	X	X	X	X	X	X
PRECIP. AMT. (3-hourly)	M		X	X	X	X	X	X
CEILING	FT/100	X		X		X		
VISIBILITY	MI	X		X		X		
SKY COVER	CODED	X		X		X		

*SUM is run at 0700 and 1900 GMT and forecast projections are 2, 5, 8, 11, 14, and 17 hours. However in anticipation of a change in run time to 0600 and 1800 GMT, these latter run times are used in identification word 4 together with taus of 3, 6, 9, 12, 15, 18 for ease of merging data from before and after the change.

In addition to the SUM fields on the tape, the first P records for each run time contain hourly observations in the following format.

Word 1 : 7777_{10} signifies this record contains hourly data

Words 2-3: Not used

Word 4 : Date-time in same form as in Word 4 of standard NMC label

Word 5 : Not used

Words 6-477: Hourly observations for 236 MOS stations. Each packed report requires two words, which are located sequentially. For instance, words 6 and 7 together contain one complete report. Stations are stored in ascending WBAN number order. The packed format and list of stations is given in "Format of Hourly Saved Data".

Words 478-510: Not used

There will usually be two of these records (P=2), one for each of 2 hours, the last being the model run time. However, if one or more of these hours of data are missing, the corresponding record may be omitted (P<2). In a rare case no hourly data might be present (P=0). Note that the record size is 510 words for the hourly observations as well as for the grid-point fields.

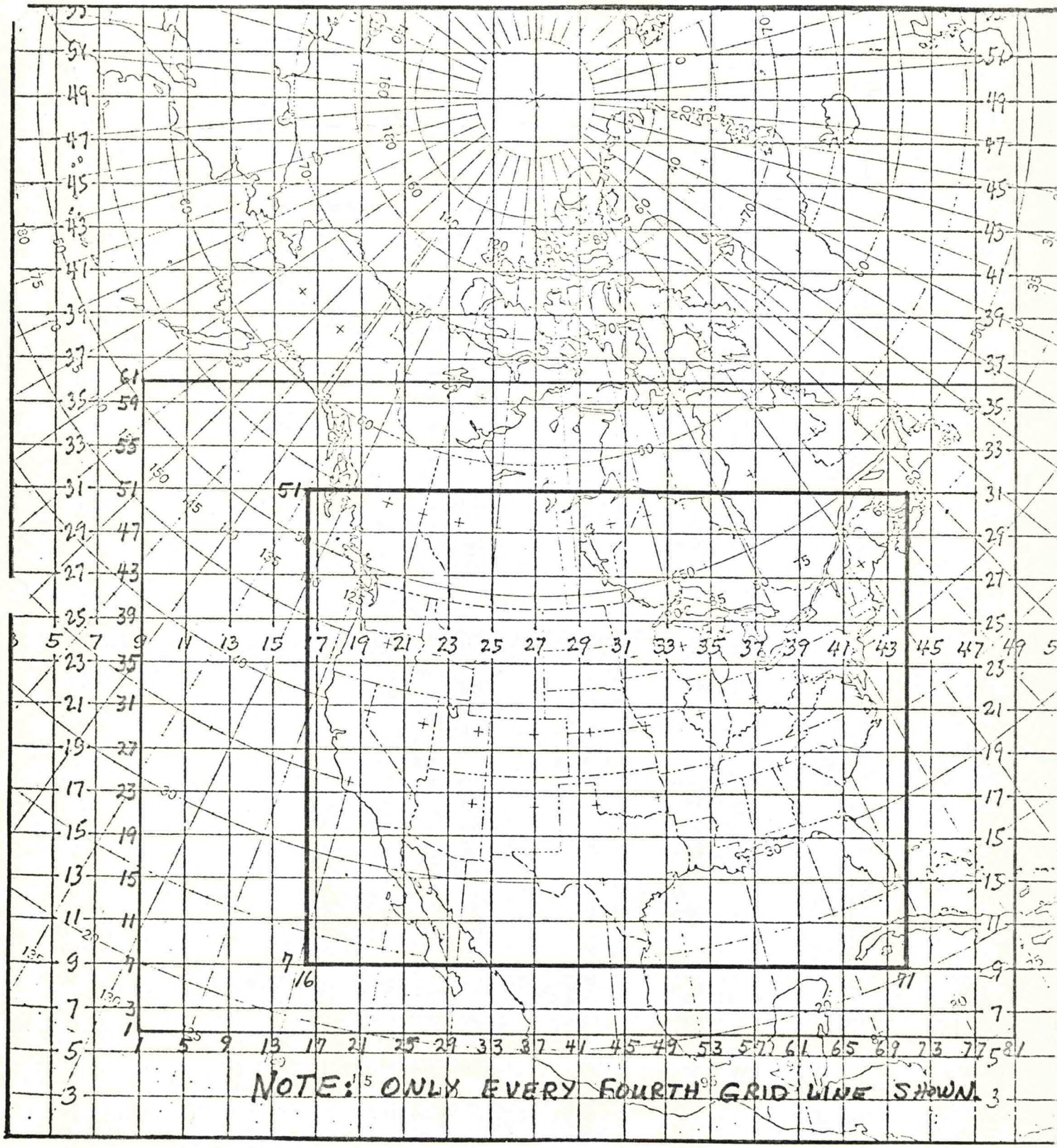
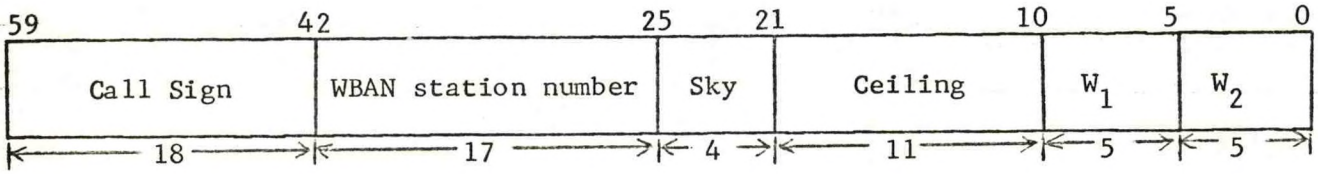


Figure IV-4 --Grid on which SUM data are collected for the MOS System. The 61x81 SUM grid is shown with the LFM grid as a background.

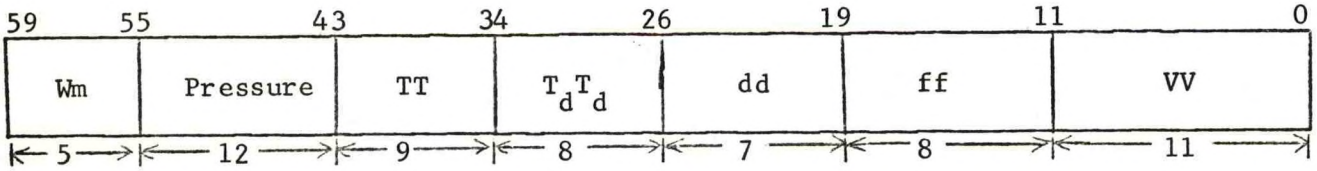
Format of Hourly Saved Data

See "Sum Data Collection" for background information.

1st Word



2nd Word



Word	Parameter	Bit Location	Parameter Explanation
1	Call Sign	42 - 59	Station name, left justified display code
1	Station No.	25 - 41	Five digit integer WBAN station number
1	Sky	21 - 24	Code number from table A
1	Ceiling	10 - 20	Ceiling in hundreds of feet--unlimited =777
1	W_1	5 - 9	First reported weather variable, code from table B
1	W_2	0 - 4	Second reported weather variable, code from table B
2	Wm	55 - 59	Weather intensity of W_1, code number from table C
2	Pressure	43 - 54	Sea level pressure in tenths of millibars
2	TT	34 - 42	Temperature in whole degrees fahrenheit
2	T_dT_d	26 - 33	Dew point in whole degrees fahrenheit
2	dd	19 - 25	Wind direction in tens of degrees
2	ff	11 - 18	Wind speed in whole knots
2	VV	0 - 10	Visibility in miles X 16

Notes:

1. All parameters are in binary, with the exception of station name.
2. Missing parameter is indicated by largest positive value except for variables W_1 and W_2 where missing is indicated by all bits set to 1.
3. Pressure is packed as it is received on teletype, i.e., the leftmost one or two digits (hundreds and thousands digits) are omitted.
4. Negatives are ones complements for variables TT, T_dT_d, and sky.

Table A -- Sky Cover

1 - Clear
2 - Scattered
3 - Broken
4 - Overcast
5 - Obscuration

- 2 - Thin Scattered
- 3 - Thin Broken
- 4 - Thin Overcast
- 5 - Partial Obscuration

Table B -- Weather

+0 - None
1 - Hail (A)
2 - Thunderstorm
3 - Rain (R)
4 - Snow (S)
5 - Freezing Rain (ZR)
6 - Snow Pellets (SP)
7 - Snow Grains (SG)
8 - Ice Crystals (IC)
9 - Ice Pellets (IP)
10 - Drizzle (L)
11 - Freezing Drizzle (ZL)
12 - Rain Showers (RW)
13 - Snow Showers (SW)
14 - Ice Pellet Showers (IPW)
15 - Haze (H)
16 - Smoke (K)
17 - Fog (F)
18 - Ice Fog (IF)
19 - Ground Fog (GF)

Table C -- Intensity of Weather

+0 - None
1 - Very Light (- -)
2 - Light (-)
3 - Heavy (severe) (+)

Format of PEATMOS Grid-Point Predictor Tapes

A - Multiple files (one per run time), each having multiple records consisting of:

Word 1 : Data identifier in the form yyyxxxtttttt octal (right justified), where
yyy = level of data
xxx = type of data
tttttt = forecast projection tau

Word 2 : Basic date (run time) in the (integer) form
2 digits of year * 1000000 + 2 digits of month * 10000 + 2 digits of day * 100 + hour

Words 3-329: data for 327 grid points.

The first data word for a particular grid is the lower left value. Skanning of the grid is then by column (upward) from left to right.

B - Double EOF indicates end of data on tape

COMMENTS: A "Collection" of tapes contains data (initial fields and/or forecasts) form the PE and TRAJ models for one run time, 0000 or 1200 GMT for any number of days in sequence. The number of words per record is 329.

I/O MODE: These are 7-track tapes written in 556 bpi density with the BUFFER OUT statement with the S-Tape driver. (Use the request card REQUEST,TAPEX,HI,S.)

PEATMOS DATA COLLECTION

Initial and forecast fields from the NMC hemispheric 6-layer PE model and the TDL TRAJ model were archived over the same 4 grids, shown in Figure IV-1, identification in "PE Data Collection" for the period July 3, 1969 to October 30, 1972. These data are not packed, have two leading identifiers, and can be processed with program P130A (see Figure III-1). A separate collection exists for 0000 and 1200 GMT.

The fields saved are listed in the table below. The units used are those in use by NMC when the data collection started. There are 103 records/run for the period July 4, 1969 - August 7, 1970. Then 4 more fields were added, for each of 8 projections, making a total of 135 records for the remainder of the collection.

VARIABLES SAVED FROM TRAJECTORY MODEL

Variable	Units	Forecast Interval to + 0 6 12 18 24 30 36 42 48
SURFACE TEMPERATURE	DEG C	X
SURFACE DEW POINT	DEG C	X
850 MB TEMPERATURE	DEG C	X
850 MB DEW POINT	DEG C	X
700 MB TEMPERATURE	DEG C	X
700 MB DEW POINT	DEG C	X
700 MB 12-HR NET VERT. DISPL.	MB	X
700 MB REL. HUMID.	PERCENT	X
SFC REL. HUMID.	PERCENT	X
850 MB REL. HUMID.	PERCENT	X
700-SFC MEAN REL. HUMID.	PERCENT	X
SFC 12-HR NET VERT. DISPL.	MB	X
850 MB 12-HR NET VERT. DISPL.	MB	X
SFC 24-HR NET VERT. DISPL.	MB	X
850 MB 24-HR NET VERT. DISPL.	MB	X
700 MB 24-HR NET VERT. DISPL.	MB	X
SFC 6-HR NET VERT. DISPL.	MB	X
850 MB 6-HR NET VERT. DISPL.	MB	X
700 MB 6-HR NET VERT. DISPL.	MB	X
700-SFC CNVCTV. INSTAB.	DEG C	X
850 MB NET VERT. VEL. (12-24 HR)	MB	X
SFC 12-HR PRECIP. AMT (12-24 HR)	INCHES	X
SFC 12-HR HORIZ. CVGNC.	SEC-1	X
850 MB 12-HR HORIZ. CVGNC.	SEC-1	X

VARIABLES SAVED FROM PE MODEL

Variable	Units	Forecast Interval to + 0 6 12 18 24 30 36 42 48
1000 MB HEIGHT	CM-11300	X X X X X X
850 MB HEIGHT	CM-145700	X X X X X X
500 MB HEIGHT	CM-557200	X X X X X X
1000 MB TEMP.	DEG C	X X X X X
850 MB TEMP.	DEG C	X X X X X
700 MB TEMP.	DEG C	X X
500 MB TEMP.	DEG C	X
B.L. POT. TEMP.	DEG C	X X X X X X
SURFACE PRESS. (p*)	CB-90	X X X X X X
B.L. U	M/SEC	X X X X X X
B.L. V	M/SEC	X X X X X X
*B.L. ω	MICROBARS/SEC	X X X X X X X X
REL. HUM. (SFC-490)	PERCENT	X X X X X X X X
*REL. HUM. (B.L.)	PERCENT	X X X X X X X X
*(REL. HUM.) 1	PERCENT	X X X X X X X X
*(REL. HUM.) 2	PERCENT	X X X X X X X X
PRECIP. WATER	INCHES x 10^2	X X X
PRECIP. AMT.	INCHES x 10^2	X X X X
850 MB U	KNOTS	X
850 MB V	KNOTS	X
700 MB U	KNOTS	X
700 MB V	KNOTS	X
500 MB U	KNOTS	X
500 MB V	KNOTS	X
1000 MB ω	MICROBARS/SEC	X
850 MB ω	MICROBARS/SEC	X
650 MB ω	MICROBARS/SEC	X

*These 4 variables, boundary layer vertical velocity and the relative humidity in 4 layers are available only after August 8, 1970.

B.L. = lowest 50 mb;
Layer 1 = B.L. top to ~ 720 mb
Layer 2 = ~720 mb to ~ 490 mb

V. MOS INTERPOLATED PREDICTOR TAPES

The format of the MOS interpolated predictor tapes is indicated in this section. The NMC 5 to 1 packer (W3AI00) and unpacker (W3AI01) are used for the data records. These tapes are prepared by M200, M300, or M400

Format of MOS Interpolated Predictor Tapes

A - Header file consisting of

Record 1:

Word 1 : Number of stations (NSTNTP).

Word 2 : Reserved for future use.

Word 3 : Number of words in each packed data record (LHBLK). A zero signifies data are not packed.

Words 4-5: Reserved for future use.

Record 2: NSTNTP words, List of station numbers (5 digit WBAN) in order as data appear in records (LWBNX( )).

Record 3: NSTNTP words, First 10 characters of station names (NAMEX(,1)).

Record 4: NSTNTP words, Second 10 characters of station names (NAMEX(,2)).

B - Multiple records, consisting of one or more "arrays" of data. Each array has the format:

Word 1 : yyyxxxmmfftttttt, where

yyy = 3 octal digit identifier of level of data. Fields involving more than one level will be given a special "level" designator.

xxx = 3 octal digit identifier of type of data.

mm = 2 digits modification identifier, used primarily for smoothing. 0 = no modification.

ff = 2 digits indicating model producing forecast, 0 = PE; 1 = Trajectory; 2 = LFM; 3 = SUM; 4 = PBL.

tttttt = forecast projection tau.

Word 2 : Basic date, YR*1000000 + MO*10000 + DA*100 + HR

Word 3 : 10 characters of plain text identification.

Word 4 : Leftmost 30 bits contain 5 characters of plain text identification (follows word 3). Bits 10 through 27 (from right) contain number of data words in record (see NMC Office Note 28).

Word 5 : Same format as word 5 of NMC 5-word identifier, used by unpacker.

Words 6-NPKWDS: Packed data, 12 bits per word. These are data values at NSTNTP stations.

These arrays are "blocked" to a maximum of 2048 words per record.

C - Double EOF indicates end of data on tape.

COMMENTS: This format allows for changing the number or order of stations on different tapes. Note that a change may not occure within a tape. The number of "arrays" of data (types of data) can be different for different dates.

I/O MODE: These are 7-track tapes written in 800 bpi density with the BUFFER OUT statement with the L-Tape driver. (Use the request card REQUEST,TAPEX,L.) Tests (May 1972) indicate that this is the most efficient method of several alternatives.

USE : Tape reading can be accomplished with subroutines RDX and RDXY.

VI. MOS ASHEVILLE TAPES

Three-hourly observations for 255 U.S. stations are received monthly from NWRC at Asheville. Prior to October 1, 1972 and since July 1, 1969 six-hourly observations for 254 stations were received. Station lists and the format now being used are given in this section.

Format of MOS Asheville Tapes

A - Multiple records of 320 words each. Each "observation hour" for a particular station requires 5 words. Therefore, each record contains 64 observation hours. The 5 words of Card Image, BCD information available for each hour are explained in "MOS Card Format". Data are available for hours 0300, 0600, 0900, 1200, 1500, 1800, 2100, and 2400 GMT. (Note that 0000 GMT for a particular date is indicated by 2400 GMT of the previous day.) All data for 0300 GMT preceeds data for 0600 GMT, etc. Observations are ordered by WBAN number (smallest first) within the observation hours. Data for 255 stations will require 32 records/day (four for each of eight observation times).

B - EOF indicates end of data on tape

COMMENTS: A tape containing one month of data is received from Asheville about 5 weeks after the end of the month. The data are then checked by a combination automatic-manual process and put into the form specified in "Format of MOS Predictand Tapes" and "Predictand Data Matrix Description".

I/O MODE: These are 7-track BCD tapes written in 556 bpi density. Use the request card REQUEST, TAPEX, HI, S. to read the tapes with the even parity BUFFER IN statement. Example: DIMENSION DATA(320), BUFFER IN(X,0) (DATA(1),DATA(320)). Note: the formatted FORTRAN READ statement cannot be used for 320-word records.

MOS CARD FORMAT
(STARTING OCTOBER, 1972)

SOURCE OF INFORMATION	DESIRED INFORMATION	TDL CARD COLUMN
Card 1	Station number	1-5
Card 1	Year	6-7
Card 1	Month	8-9
Card 1	Day	10-11
Card 1 (with change)	Hour (In Greenwich time with hour 0000 GMT being punched as 24. 0700 EST would be 12, etc.)	12-13
Card 1	Ceiling in hundreds of feet	14-16
Card 1 (with change to col. 17-20)	Sky condition (total) where 0= clear; 1 = partial obscuration (-x); 2 = thin scattered (- ⊘); 3 = thin broken (- ◯); 4 = thin overcast (- ⊜); 5 = scattered (⊘); 6 = broken (◔); 7 = overcast (⊜); 8 = obscured (x); 9 = missing data	17
Card 1 (with change to col. 21-23)	Visibility in miles and hundredths (i.e. 2½ miles would be 0250; 100 miles or more would be 9900; 3/4 of a mile would be 0075, etc.)	18-21
Card 1	Weather and/or obstruction to vision	22-29
Card 1	Dew Point in °F	30-32
Card 1	Wind direction in tens of degrees	33-34
Card 1 (with change)	Wind speed in knots (no overpunches are needed with three columns (i.e. the value 112 kts is punched 112))	35-37
Card 1	Dry bulb temperature in °F	38-40
Hourly precipitation cards 1 and 2 (with changes)	Six-hourly precipitation amounts in inches and hundredths. 12 to 18 GMT six-hourly amount on 18 GMT card. 18 to 24 GMT six-hourly amount on 24 GMT card, etc. (i.e. .01 = 0001; 1.25 = 0125; 12.00 = 1200; T (trace) = 000x; 0 (None) = 0000, etc.	41-44
Card 3	Daily maximum temperature in °F. (To appear on 24 GMT card only). All other cards to have 999 in columns 45-47, except 18 GMT where the daily minimum temperature will appear.	45-47
Card 1 (with change)	Opaque sky cover in tenths (i.e. one tenth = 01, nine tenths = 09, missing = 99, etc.)	48-49
Card 3 (with change)	Snow depth in inches at 12 GMT where - = T, 0 = none, 1 = 1, 2 = 2, 3 = 3, 4 = 4, 5 = 5, 6 = 6 to 10, 7 = 11 to 20, 8 = more than 20, 9 = missing data. All times other than 12 GMT have 9 in column 50.	50

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed alphabetically)

STATION NAME	CALL LETTERS	WBAN NO.
Aberdeen, S. D.	ABR	14929
Abilene, Texas	ABI	13962
Akron-Canton, Ohio	CAK	14895
Albany, N. Y.	ALB	14735
Albuquerque, N. M.	ABQ	23050
Alexandria, La.	ESF	13935
Allentown, Pa.	ABE	14737
Alpena, Mich.	APN	94849
Amarillo, Texas	AMA	23047
Anchorage, Alaska	ANC	26451
Annette, Alaska	ANN	25308
Arcata, Calif.	ACV	24283
Asheville, N. C.	AVL	03812
Astoria, Ore.	AST	94224
Athens, Ga.	AHN	13873
Atlanta, Ga.	ATL	13874
Atlantic City, N. J.	ACY	93730
Augusta, Ga.	AGS	03820
Austin, Texas	AUS	13958
Bakersfield, Calif.	BFL	23155
Baltimore, Md.	BAL	93721
Bangor, Me.	BGR	14606
Barrow, Alaska	BRW	27502
Barter Island, Alaska	BTI	27401
Baton Rouge, La.	BTR	13970
Beckley, W. Va.	BKW	03872
Bethel, Alaska	BET	26615
Billings, Montana	BIL	24033
Binghamton, N. Y.	BGM	04725
Birmingham, Ala.	BHM	13876
Bismarck, N. D.	BIS	24011
Boise, Ida.	BOI	24131
Boothville, La.	BVE	12884
Boston, Mass.	BOS	14739
Bradford, Pa.	BFD	04751
Bridgeport, Conn.	BDR	94702
Bristol, Tenn.	TRI	13877
Brownsville, Texas	BRO	12919
Bryce Canyon, Utah	BCE	23159

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed alphabetically)

STATION NAME	CALL LETTERS	WBAN NO.
Buffalo, N. Y.	BUF	14733
Burlington, Iowa	BRL	14931
Burlington, Vt.	BTV	14742
Burns, Ore.	4BW	24134
Cape Hatteras, N. C.	HAT	93729
Caribou, Me.	CAR	14607
Casper, Wyo.	CPR	24089
Cedar City, Utah	CDC	93129
Charleston, S. C.	CHS	13880
Charleston, W. Va.	CRW	13866
Charlotte, N. C.	CLT	13881
Chattanooga, Tenn.	CHA	13882
Cheyenne, Wyo.	CYS	24018
Chicago-Midway, Ill.	MDW	14819
Chicago-Ohare, Ill.	ORD	94846
Cincinnati, Ohio	CVG	93814
Cleveland, Ohio	CLE	14820
Cold Bay, Alaska	CDB	25624
Colorado Springs, Colo.	COS	93037
Columbia, Mo.	COU	03945
Columbia, S. C.	CAE	13883
Columbus, Ohio	CMH	14821
Concord, N. H.	CON	14745
Concordia, Kansas	CNK	13984
Corpus Christi, Texas	CRP	12924
Daggett, Calif.	DAG	23161
Dallas, Texas	DAL	13960
Dayton, Ohio	DAY	93815
Daytona Beach, Fla.	DAB	12834
Del Rio, Texas	DRT	22010
Denver, Colo.	DEN	23062
Des Moines, Iowa	DSM	14933
Detroit, Mich.	DTW	94847
Dodge City, Kansas	DDC	13985
Dubuque, Iowa	DBQ	94908
Duluth, Minn.	DLH	14913
Eau Claire, Wis.	EAU	14991
Elkins, W. Va.	EKN	13729
Elko, Nev.	EKO	24121

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed alphabetically)

STATION NAME	CALL LETTERS	WBAN NO.
El Paso, Texas	ELP	23044
Ely, Nev.	ELY	23154
Erie, Pa.	ERI	14860
Eugene, Ore.	EUG	24221
Evansville, Ind.	EVV	93817
Fairbanks, Alaska	FAI	26411
Fargo, N. D.	FAR	14914
Farmington, N. M.	FMN	23090
Flagstaff, Ariz.	FLG	03103
Flint, Mich.	FNT	14826
Ft Myers, Fla.	FMY	12835
Ft. Smith, Ark.	FSM	13964
Fort Wayne, Ind.	FWA	14827
Ft Worth, Texas	GSW	03927
Fresno, Calif.	FAT	93193
Glasgow, Montana	GGW	94008
Goodland, Kansas	GLD	23065
Grand Island, Neb.	GRI	14935
Grand Junction, Colo.	GJT	23066
Grand Rapids, Mich.	GRR	94860
Great Falls, Montana	GTF	24143
Green Bay, Wis.	GRB	14898
Greensboro, N. C.	GSO	13723
Greenville, S. C.	GSP	03870
Harrisburg, Pa.	HAR	14751
Hartford, Conn.	BDL	14740
Havre, Montana	HVR	94012
Helena, Montana	HLN	24144
Hilo, Hawaii	PHTO	21504
Honolulu, Hawaii	PHNL	22521
Houghton Lake, Mich.	HTL	94814
Houston, Texas	IAH	12960
Huntington, W. Va.	HTS	03860
Huntsville, Ala.	HSV	03856
Huron, S. D.	HON	14936
Indianapolis, Ind.	IND	93819
International Falls, Minn.	INL	14918
Jackson, Miss.	JAN	03940
Jacksonville, Fla.	JAX	13889

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed alphabetically)

STATION NAME	CALL LETTERS	WBAN NO.
Juneau, Alaska	JNU	25309
Kahului, Hawaii	PHOG	22516
Kalispell, Montana	FCA	24146
Kansas City, Mo.	MKC	03947
Key West, Fla.	EYW	12836
King Salmon, Alaska	AKN	25503
Knoxville, Tenn.	TYS	13891
Kotzebue, Alaska	OTZ	26616
Lacrosse, Wis.	LSE	14920
Lake Charles, La.	LCH	03937
Lander, Wyo.	LND	24021
Lansing, Mich.	LAN	14836
Las Vegas, Nev.	LAS	23169
Lexington, Ky.	LEX	93820
Lihue, Hawaii	PHLI	22536
Little Rock, Ark.	LIT	13963
Long Beach, Calif.	LGB	23129
Los Angeles, Calif.	LAX	23174
Louisville, Ky.	SDF	93821
Lovelock, Nev.	LOL	24172
Lubbock, Texas	LBB	23042
Lufkin, Texas	LFK	93987
Lynchburg, Va.	LYH	13733
Macon, Ga.	MCN	03813
Madison, Wis.	MSN	14837
Mason City, Iowa	MCW	14940
Massena, N. Y.	MSS	94725
McGrath, Alaska	MCG	26510
Medford, Ore.	MFR	24225
Memphis, Tenn.	MEM	13893
Meridian, Miss.	MEI	13865
Miami, Fla.	MIA	12839
Midland, Texas	MAF	23023
Milwaukee, Wis.	MKE	14839
Minneapolis, Minn.	MSP	14922
Minot, N. D.	MOT	24013
Missoula, Montana	MSO	24153
Mobile, Ala.	MOB	13894
Moline, Ill.	MLI	14923

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed alphabetically)

STATION NAME	CALL LETTERS	WBAN NO.
Montgomery, Ala.	MGM	13895
Muskegon, Mich.	MKG	14840
Nashville, Tenn.	BNA	13897
Newark, N. J.	EWR	14734
New Orleans, La.	MSY	12916
New York-Kennedy, N. Y.	JFK	94789
New York-Laguardia, N. Y.	LGA	14732
Nome, Alaska	OME	26617
Norfolk, Va.	ORF	13737
North Bend, Ore.	OTH	24284
North Platte, Neb.	LBF	24023
Oakland, Calif.	OAK	23230
Okla. City, Okla.	OKC	13967
Olympia, Wash.	OLM	24227
Omaha, Neb.	OMA	14942
Orlando, Fla.	ORL	12841
Pendleton, Ore.	PDT	24155
Pensacola, Fla.	PNS	13899
Peoria, Ill.	PIA	14842
Philadelphia, Pa.	PHL	13739
Phoenix, Ariz.	PHX	23183
Pierre, S. D.	PIR	24025
Pittsburg, Pa.	PIT	94823
Pocatello, Ida.	PIH	24156
Portland, Me.	PWM	14764
Portland, Ore.	PDX	24229
Providence, RI.	PVD	14765
Pueblo, Colo.	PUB	93058
Quillayute, Wash.	UIL	94240
Raleigh-Durham, N. C.	RDU	13722
Rapid City, S. D.	RAP	24090
Red Bluff, Calif.	RBL	24216
Redmond, Ore.	RDM	24230
Reno, Nev.	RNO	23185
Richmond, Va.	RIC	13740
Roanoke, Va.	ROA	13741
Rochester, Minn.	RST	14925
Rochester, N. Y.	ROC	14768
Rockford, Ill.	RFD	94822

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed alphabetically)

STATION NAME	CALL LETTERS	WBAN NO.
Rock Springs, Wyo.	RKS	24027
Russell, Kansas	RSL	93997
Sacramento, Calif.	SAC	23232
Salem, Ore.	SLE	24232
Salt Lake City, Utah	SLC	24127
San Angelo, Texas	SJT	23034
San Antonio, Texas	SAT	12921
San Diego, Calif.	SAN	23188
San Francisco, Calif.	SFO	23234
San Juan, P. R.	MJSJ	11641
Santa Maria, Calif.	SMX	23273
Sault Ste Marie, Mich.	SSM	14847
Savannah, Ga.	SAV	03822
Scottsbluff, Neb.	BFF	24028
Scranton, Pa.	AVP	14777
Seattle-Tacoma, Wash.	SEA	24233
Sheridan, Wyo.	SHR	24029
Shreveport, La.	SHV	13957
Sioux City, Iowa	SUX	14943
Sioux Falls, S. D.	FSD	14944
South Bend, Ind.	SBN	14848
Spokane, Wash.	GEG	24157
Springfield, Ill.	SPI	93822
Springfield, Mo.	SGF	13995
St Joseph, Mo.	STJ	13993
St Louis, Mo.	STL	13994
Stockton, Calif.	SCK	23237
St Paul Island, Alaska	SNP	25713
Syracuse, N. Y.	SYR	14771
Tallahassee, Fla.	TLH	93805
Tampa, Fla.	TPA	12842
Toledo, Ohio	TOL	94830
Tonopah, Nev.	TPH	23153
Topeka, Kansas	TOP	13996
Traverse City, Mich.	TVC	14850
Truth or Cons, N. M.	TCS	93045
Tucson, Ariz.	TUS	23160
Tucumcari, N. M.	TCC	23048

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed alphabetically)

STATION NAME	CALL LETTERS	WBAN NO.
Tulsa, Okla.	TUL	13968
Victoria, Texas	VCT	12912
Waco, Texas	ACT	13959
Wallops Island, Va.	WAL	93739
Washington, D. C.	DCA	13743
Wash-Dulles, Va.	IAD	93738
Waterloo, Iowa	ALO	94910
Wendover, Utah	ENV	24193
West Palm Beach, Fla.	PBI	12844
Wichita, Kansas	ICT	03928
Wichita Falls, Texas	SPS	13966
Williamsport, Pa.	IPT	14778
Williston, N. D.	ISN	94014
Wilmington, Del.	ILG	13781
Wilmington, N. C.	ILM	13748
Winnemucca, Nevada	WMC	24128
Winslow, Ariz.	INW	23194
Yakima, Wash.	YKM	24243
Yakutat, Alaska	YAK	25339
Youngstown, Ohio	YNG	14852
Yuma, Ariz.	YUM	23195
Zuni, N. M.	ZUN	93044

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed by WBAN number)

WBAN NO.	STATION NAME	CALL LETTERS
03103	Flagstaff, Ariz.	FLG
03812	Asheville, N. C.	AVL
03813	Macon, Ga.	MCN
03820	Augusta, Ga.	AGS
03822	Savannah, Ga.	SAV
03856	Huntsville, Ala.	HSV
03860	Huntington, W. Va.	HTS
03870	Greenville, S. C.	GSP
03872	Beckley, W. Va.	BKW
03927	Ft. Worth, Texas	GSW — DFW
03928	Wichita, Kansas	ICT
03937	Lake Charles, La.	LCH
03940	Jackson, Miss.	JAN
03945	Columbia, Mo.	COU
03947	Kansas City, Mo.	MKC
04725	Binghamton, N. Y.	BGM
04751	Bradford, Pa.	BFD
11641	San Juan, P. R.	MJSJ
12834	Daytona Beach, Fla.	DAB
12835	Ft. Myers, Fla.	FMY
12836	Key West, Fla.	EYW
12839	Miami, Fla.	MIA
12841	Orlando, Fla.	ORL
12842	Tampa, Fla.	TPA
12844	West Palm Beach, Fla.	PBI
12884	Boothville, La.	BVE
12912	Victoria, Texas	VCT
12916	New Orleans, La.	MSY
12919	Brownsville, Texas	BRO
12921	San Antonio, Texas	SAT
12924	Corpus Christi, Texas	CRP
12960	Houston, Texas	IAH
13722	Raleigh-Durham, N. C.	RDU
13723	Greensboro, N. C.	GSO
13729	Elkins, W. Va.	EKN
13733	Lynchburg, Va.	LYH
13737	Norfolk, Va.	ORF
13739	Philadelphia, Pa.	PHL
13740	Richmond, Va.	RIC
13741	Roanoke, Va.	ROA
13743	Washington, D. C.	DCA
13748	Wilmington, N. C.	ILM
13781	Wilmington, Del.	ILG
13865	Meridian, Miss.	MEI
13866	Charleston, W. Va.	CRW
13873	Athens, Ga.	AHN
13874	Atlanta, Ga.	ATL
13876	Birmingham, Ala.	BHM

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed by WBAN number)

WBAN NO.	STATION NAME	CALL LETTERS
13877	Bristol, Tenn.	TRI
13880	Charleston, S. C.	CHS
13881	Charlotte, N. C.	CLT
13882	Chattanooga, Tenn.	CHA
13883	Columbia, S. C.	CAE
13889	Jacksonville, Fla.	JAX
13891	Knoxville, Tenn.	TYS
13893	Memphis, Tenn.	MEM
13894	Mobile, Ala.	MOB
13895	Montgomery, Ala.	MGM
13897	Nashville, Tenn.	BNA
13899	Pensacola, Fla.	PNS
13935	Alexandria, La.	ESF
13957	Shreveport, La.	SHV
13958	Austin, Texas	AUS
13959	Waco, Texas	ACT
13960	Dallas, Texas	DAL
13962	Abilene, Texas	ABI
13963	Little Rock, Ark.	LIT
13964	Ft. Smith, Ark.	FSM
13966	Wichita Falls, Texas	SPS
13967	Okla. City, Okla.	OKC
13968	Tulsa, Okla.	TUL
13970	Baton, Rouge, La.	BTR
13984	Concordia, Kansas	CNK
13985	Dodge City, Kansas	DDC
13993	St. Joseph, Mo.	STJ
13994	St. Louis, Mo.	STL
13995	Springfield, Mo.	SGF
13996	Topeka, Kansas	TOP
14606	Bangor, Me.	BGR
14607	Caribou, Me.	CAR
14732	New York-Laguardia, N.Y.	LGA
14733	Buffalo, N. Y.	BUF
14734	Newark, N. J.	EWR
14735	Albany, N. Y.	ALB
14737	Allentown, Pa.	ABE
14739	Boston, Mass.	BOS
14740	Hartford, Conn.	BDL

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed by WBAN number)

WBAN NO.	STATION NAME	CALL LETTERS
14742	Burlington, Vt.	BTV
14745	Concord, N. H.	CON
14751	Harrisburg, Pa.	HAR
14764	Portland, Me.	PWM
14765	Providence, RI.	PVD
14768	Rochester, N. Y.	ROC
14771	Syracuse, N. Y.	SYR
14777	Scranton, Pa.	AVP
14778	Williamsport, Pa.	IPT
14819	Chicago-Midway, Ill.	MDW
14820	Cleveland, Ohio	CLE
14821	Columbus, Ohio	CMH
14826	Flint, Mich.	FNT
14827	Fort Wayne, Ind.	FWA
14836	Lansing, Mich.	LAN
14837	Madison, Wis.	MSN
14839	Milwaukee, Wis.	MKE
14840	Muskegon, Mich.	MKG
14842	Peoria, Ill.	PIA
14847	Sault Ste. Marie, Mich.	SSM
14848	South Bend, Ind.	SBN
14850	Traverse City, Mich.	TVC
14852	Youngstown, Ohio	YNG
14860	Erie, Pa.	ERI
14895	Akron-Canton, Ohio	CAK
14898	Green Bay, Wis.	GRB
14913	Duluth, Minn.	DLH
14914	Fargo, N. D.	FAR
14918	International Falls, Minn.	INL
14920	Lacrosse, Wis.	LSE
14922	Minneapolis, Minn.	MSP
14923	Moline, Ill.	MLI
14925	Rochester, Minn.	RST
14929	Aberdeen, S. D.	ABR
14931	Burlington, Iowa	BRL
14933	Des Moines, Iowa	DSM
14935	Grand Island, Neb.	GRI
14936	Huron, S. D.	HON
14940	Mason City, Iowa	MCW
14942	Omaha, Neb.	OMA

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed by WBAN number)

WBAN NO.	STATION NAME	CALL LETTERS
14943	Sioux City, Iowa	SUX
14944	Sioux Falls, S. D.	FSD
14991	Eau Claire, Wis.	EAU
21504	Hilo, Hawaii	PHTO
22010	Del Rio, Texas	DRT
22516	Kahului, Hawaii	PHOG
22521	Honolulu, Hawaii	PHNL
22536	Lihue, Hawaii	PHLI
23023	Midland, Texas	MAF
23034	San Angelo, Texas	SJT
23042	Lubbock, Texas	LBB
23044	El Paso, Texas	ELP
23047	Amarillo, Texas	AMA
23048	Tucumcari, N. M.	TCC
23050	Albuquerque, N. M.	ABQ
23062	Denver, Colo.	DEN
23065	Goodland, Kansas	GLD
23066	Grand Junction, Colo.	GJT
23090	Farmington, N. M.	FMN
23129	Long Beach, Calif.	LGB
23153	Tonopah, Nev.	TPH
23154	Ely, Nev.	ELY
23155	Bakersfield, Calif.	BFL
23159	Bryce Canyon, Utah	BCE
23160	Tucson, Ariz.	TUS
23161	Daggett, Calif.	DAG
23169	Las Vegas, Nev.	LAS
23174	Los Angeles, Calif.	LAX
23183	Phoenix, Ariz.	PHX
23185	Reno, Nev.	RNO
23188	San Diego, Calif.	SAN
23194	Winslow, Ariz.	INW
23195	Yuma, Ariz.	YUM
23230	Oakland, Calif.	OAK
23232	Sacramento, Calif.	SAC
23234	San Francisco, Calif.	SFO
23237	Stockton, Calif.	SCK
23273	Santa Maria, Calif.	SMX
24011	Bismarck, N. D.	BIS
24013	Minot, N. D.	MOT

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed by WBAN number)

WBAN NO.	STATION NAME	CALL LETTERS
24018	Cheyenne, Wyo.	CYS
24021	Lander, Wyo.	LND
24023	North Platte, Neb.	LBF
24025	Pierre, S. D.	PIR
24027	Rock Springs, Wyo.	RKS
24028	Scottsbluff, Neb.	BFF
24029	Sheridan, Wyo.	SHR
24033	Billings, Montana	BIL
24089	Casper, Wyo.	CPR
24090	Rapid City, S. D.	RAP
24121	Elko, Nev.	EKO
24127	Salt Lake City, Utah	SLC
24128	Winnemucca, Nev.	WMC
24131	Boise, Ida.	BOI
24134	Burns, Ore.	4BW
24143	Great Falls, Mont.	GTF
24144	Helena, Mont.	HLN
24146	Kalispell, Mont.	FCA
24153	Missoula, Mont.	MSO
24155	Pendleton, Ore.	PDT
24156	Pocatello, Ida.	PIH
24157	Spokane, Wash.	GEG
24172	Lovelock, Nev.	LOL
24193	Wendover, Utah	ENV
24216	Red Bluff, Calif.	RBL
24221	Eugene, Ore.	EUG
24225	Medford, Ore.	MFR
24227	Olympia, Wash.	OLM
24229	Portland, Ore.	PDX
24230	Redmond, Ore.	RDM
24232	Salem, Ore.	SLE
24233	Seattle-Tacoma, Wash.	SEA
24243	Yakima, Wash.	YKM
24283	Arcata, Calif.	ACV
24284	North Bend, Ore.	OTH
25308	Annette, Alaska	ANN
25309	Juneau, Alaska	JNU
25339	Yakutat, Alaska	YAK
25503	King Salmon, Alaska	AKN
25624	Cold Bay, Alaska	CDB

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed by WBAN number)

WBAN NO.	STATION NAME	CALL LETTERS
25713	St Paul Island, AK.	SNP
26411	Fairbanks, Alaska	FAI
26451	Anchorage, Alaska	ANC
26510	Mcgrath, Alaska	MCG
26615	Bethel, Alaska	BET
26616	Kotzebue, Alaska	OTZ
26617	Nome, Alaska	OME
27401	Barter Island, Alaska	BTI
27502	Barrow, Alaska	BRW
93037	Colorado Springs, Colo.	COS
93044	Zuni, N. M.	ZUN
93045	Truth or Cons, N. M.	TCS
93058	Pueblo, Colo.	PUB
93129	Cedar City, Utah	CDC
93193	Fresno, Calif.	FAT
93721	Baltimore, Md.	BAL
93729	Cape Hatteras, N. C.	HAT
93730	Atlantic City, N. J.	ACY
93738	Wash-Dulles, Va.	IAD
93739	Wallops Island, Va.	WAL
93805	Tallahassee, Fla.	TLH
93814	Cincinnati, Ohio	CVG
93815	Dayton, Ohio	DAY
93817	Evansville, Ind.	EVV
93819	Indianapolis, Ind.	IND
93820	Lexington, Ky.	LEX
93821	Louisville, Ky.	SDF
93822	Springfield, Ill.	SPI
93987	Lufkin, Texas	LFK
93997	Russell, Kansas	RSL
94008	Glasgow, Mont.	GGW
94012	Havre, Mont.	HVR
94014	Williston, N. D.	ISN
94224	Astoria, Ore.	AST
94240	Quillayute, Wash.	UIL
94702	Bridgeport, Conn.	BDR
94725	Massena, N. Y.	MSS
94789	New York-Kennedy, N. Y.	JFK
94814	Houghton Lake, Mich.	HTL

MOS SYSTEM STATIONS ON ASHEVILLE TAPES
(listed by WBAN number)

WBAN NO.	STATION NAME	CALL LETTERS
94822	Rockford, Ill,	RFD
94823	Pittsburg, Pa.	PIT
94830	Toledo, Ohio	TOL
94846	Chicago-Ohare, Ill.	ORD
94847	Detroit, Mich.	DTW
94849	Alpena, Mich.	APN
94860	Grand Rapids, Mich.	GRR
94908	Dubuque, Iowa	DBQ
94910	Waterloo, Iowa	ALO

PEATMOS to MOS Asheville Data Conversion

The present collection consists of 255 stations:

236	-	Conterminous U.S.
14	-	Alaska
4	-	Hawaii
1	-	Puerto Rico

Some of these stations do not report all elements for all hours, and the reporting pattern may change during the collection. A user can assume the data are present and let his computer program verify or deny it.

Effective October 1, 1972 when the MOS collection started and the PEATMOS collection ended the following stations were added:

Pensacolc, Fla.	PNS	13899
Alexandria, La.	ESF	13935
Bangor, Me.	BGR	14606
Ellco, Nev.	EKO	24121

Also effective October 1, 1972 the following stations were dropped:

Shemya, Alaska	SYA	45715
Nantucket, Mass.	ACK	14756
Old Town, Me.	OLD	14622

Actually, on Feb. 1, 1972 Bangor, Me. replaced Old Town, Me. but the Old Town, Me. WBAN number of 14622 was retained. That is, Bangor and Old Town data were mixed. When the PEATMOS predictand tapes were converted to the MOS format (Program M410), all Bangor and Old Town data were assigned the WBAN number 14606. Therefore, provided one is willing to mix the data from these two stations, a continuous record is available. This means, also, that of the 234 PEATMOS conterminous U.S. station, 233 can still be used, Nantucket (14756) being the only deletion.

Also effective October 1, 1972, two other station numbers were changed due to prior station relocation:

Columbia, Mo.	from	CBI	13983	to	COU 03945
Kansas City, Mo.	from	MKC	13988	to	MCI 03947

In the conversion of data from PEATMOS to MOS format (Program M410), all Columbia and Kansas City data were assigned the new numbers.

VII. MOS PREDICTAND TAPES

The Asheville data, after a careful automated and manual check, are formatted as indicated in this section. The format, and particularly the specialized packing, was derived to make tape use about as efficient as possible.

All data since (and including) October 1, 1972 have been received as specified in Section VI and put into the form described in "Predictand Data Matrix Description" of this Section. Data prior to October 1, 1972 (the PEATMOS sample) and since October 1, 1969 have been converted to the same MOS format and are maintained by George Hollenbaugh; however, certain differences in the data do exist. This conversion is described in "PEATMOS to MOS Predictand Tapes Conversion" in this Section.

Format of MOS Predictand Tapes

A - One or more files, each consisting of

1 - Header information, consisting of:

Record 1:

Word 1 - number of stations = number of rows in data matrix (NROWS)

Word 2 - number of types of data = number of columns in data matrix (NCOLS)

Word 3 - number of words in packed data matrix +1 = size of record (NWDS)

Words 4 to 20 - reserved for possible future use

Record 2:

NROWS words - list of station numbers (5 digit WBAN in order as data appear in matrix (LWBANY( ))

Record 3:

NROWS words -first 10 characters of station names (NAMEY(,1))

Record 4:

NROWS words -second 10 characters of station names (NAMEY(,2))

2 - Multiple records, consisting of:

a - Word 1 = date in YR*1000000 + MO*10000 + DA*100 + HR

b - NWDS-1 words = packed data matrix

B - End of data on tape signaled by a double EOF

Initial and forecast fields from the TDL Subsynoptic Update Model (SUM) are archived over the grid shown in Figure IV-4. Data for a total of 2520 grid points are saved. The packed data plus the five identifiers require a record size of 510 words. (An extra word is required by W3AI00 for checksum when number of points is evenly divisible by 5.) All t_o+ 0 fields preceed t_o+3 fields, etc. Period of record is about October 1, 1973 to present.

VARIABLES SAVED FROM SUM

Variable	Units	Forecast Interval* t_o+ 0	3	6	9	12	15	18
1000 MB HEIGHT	M	X	X	X	X	X	X	X
MEAN REL. HUM. (1000-500)	PERCENT	X	X	X	X	X	X	X
MEAN SP. HUM. (1000-500)	DIMENSIONLESS	X	X	X	X	X	X	X
PRECIP. AMT. (3-hourly)	M		X	X	X	X	X	X
CEILING	FT/100	X		X		X		
VISIBILITY	MI	X		X		X		
SKY COVER	CODED	X		X		X		

*SUM is run at 0700 and 1900 GMT and forecast projections are 2, 5, 8, 11, 14, and 17 hours. However in anticipation of a change in run time to 0600 and 1800 GMT, these latter run times are used in identification word 4 together with taus of 3, 6, 9, 12, 15, 18 for ease of merging data from before and after the change.

In addition to the SUM fields on the tape, the first P records for each run time contain hourly observations in the following format.

Word 1 : 7777_{10} signifies this record contains hourly data

Words 2-3: Not used

Word 4 : Date-time in same form as in Word 4 of standard NMC label

Word 5 : Not used

Words 6-477: Hourly observations for 236 MOS stations. Each packed report requires two words, which are located sequentially. For instance, words 6 and 7 together contain one complete report. Stations are stored in ascending WBAN number order. The packed format and list of stations is given in "Format of Hourly Saved Data".

Words 478-510: Not used

There will usually be two of these records (P=2), one for each of 2 hours, the last being the model run time. However, if one or more of these hours of data are missing, the corresponding record may be omitted (P<2). In a rare case no hourly data might be present (P=0). Note that the record size is 510 words for the hourly observations as well as for the grid-point fields.

Predictand Data Matrix Description

The predictand data, after being error-checked, for any given hour such as 0600 GMT, reside in floating point form in an m x n matrix, or subscripted variable DATA (,), where m (number of rows) is the number of stations for which data are present and n (number of columns) is the number of types of data present. The 17 types of data (n = 17) being used are described below:

DATA (,1) — Opaque sky cover in tenths.

0 = none
1 = one tenth
...
10 = ten tenths (includes obscured)

DATA (,2) — Obstruction to vision in coded form.

0 = none of the following
1 = Smoke (K)
2 = Haze (H) and Smoke and Haze (KH)
3 = Blowing Obstructions (BD, BN, BS, BY)
4 = Fog (F)
5 = Ice Fog (IF)
6 = Ground Fog (GF)

DATA (,3) — Ceiling in hundreds of feet.

An unlimited ceiling condition is indicated by the value 888.

DATA (,4) — Total Sky Cover in coded form.

0 = clear
1 = partial obscuration
2 = thin scattered
3 = thin broken
4 = thin overcast
5 = scattered
6 = broken
7 = overcast
8 = obscured

DATA (,5) — Visibility in miles and hundredths, converted from the observing code, for example:

.13 = 1/8 1.00 = 1
.19 = 3/16 1.50 = 1½ etc.
All observed values > 40 miles are set = 40

DATA (,6) Weather in coded form.

0 = none of below	
1 = L-, L--	14 = ZR
2 = L	15 = ZR+
3 = L+	16 = any combination of liquid and frozen precipitation
4 = R-, R--	
5 = R	17 = IP-, IP--, IPW-, IPW--
6 = R+	18 = IP, IPW
7 = RW-, RW--	19 = IP+, IPW+
8 = RW	20 = S-, S--, SP-, SP--, SG-, SG--
9 = RW+	21 = S, SP, SG
10 = ZL-, ZL--	22 = S+, SP+, SG+
11 = ZL	23 = SW-, SW--
12 = ZL+	24 = SW
13 = ZR-, ZR--	25 = SW+

DATA (,7) Dew Point in whole degrees fahrenheit.

DATA (,8) Wind Direction in whole degrees. Wind reported to nearest 10 degrees.

DATA (,9) Wind Speed in whole knots.

DATA (,10) U-Wind Component in knots computed from observed wind speed and direction.

DATA (,11) V-Wind component in knots computed from observed wind speed and direction.

DATA (,12) Temperature in whole degrees fahrenheit.

DATA (,13) 6-hour Precipitation Amount in inches and hundredths. A trace is coded as .004.

DATA (,14) Maximum and Minimum Temperature in whole degrees fahrenheit. The daily max appears in the 2400 GMT record and the daily min appears in the 1800 GMT record. Records for all other hours will contain 9999 in this column.

DATA (,15) 12-hour Precipitation Amount in inches computed from the 6-hour amounts in column 13. The 0000-1200 GMT amount appears in the 1200 GMT record, the 0600-1800 GMT amount appears in the 1800 GMT record, the 1200-2400 GMT amount appears in the 2400 GMT record, and the 1800-0600 GMT amount appears in the 0600 GMT record. Two 6-hourly traces will give .008. Records for the hours 0300, 0900, 1500, and 2100 GMT will contain 9999.

DATA (,16) Severe Weather in coded form.

0 = none of below
1 = Squall (Q)
2 = Thunderstorm (T)
3 = Severe Thunderstorm (T+)
4 = Hail (A)
5 = Tornado

DATA (,17) Snow Depth in coded form.

0 = none	5 = 4 in.
1 = Trace	6 = 5 in.
2 = 1 in.	7 = 6-10 in.
3 = 2 in.	8 = 11-20 in.
4 = 3 in.	9 = > 20 in.

A missing value for any variable is indicated by 9999.

Each data matrix, together with its date word, occupies a record (see "Format of MOS Predictand Tapes") on the predictand tape. However, it is packed with the subroutine YPKR by column so that a minimum of tape is required. Each data type may have a constant added to it and then may be multiplied by a constant in order to make it non-negative and to carry the significance desired before the floating point number is rounded to an integer.

Table VII-1 indicates that the variable Opaque Sky Cover has the range 0 through 10 and without modification requires only 4 bits per datum. Therefore, 15 values can be packed in one CDC 6600 60-bit word.

Visibility is allowed a range of 0 through 40 (all values > 40 are set = 40) and after multiplication by 100 has the range 0 through 4000. Therefore, 12 bits are required per datum and the packing ratio is 5 to 1.

Some values will not be returned by the unpacker YUNPKR exactly as they were presented to the packer YPKR. This happens when the precipitation trace value .004 is involved; it is returned as $1710406111564570651 7_8$ rather than the original 1710461115645706520_8-- just one bit off. The computed U- and V-winds are packed and unpacked to the nearest tenth of a knot.

Table VII-1. Predictand Packing Information

Row Number	Variable	Allowable Range	Multiplicative Constant*	Additive Constant*	New Range	Bits Needed	Possible Range	Data/Word	Words needed for 255 data words
1	Opaque Cloud Cover	0-10	-	-	0-10	4	0-14	15	17
2	Fog	0-6	-	-	0-6	3	0-6	20	13
3	Ceiling	0-888	-	-	0-888	10	0-1022	6	43
4	Sky Cover	0-8	-	-	0-8	4	0-14	15	17
5	Visibility	0-40	100		0-4000	12	0-4094	5	51
6	Weather	0-25	-	-	0-25	5	0-30	12	22
7	Dew Point	-70 -100	-	70	0-170	8	0-254	7	37
8	Wind Direction	0-360	-	-	0-360	9	0-510	6	43
9	Wind Speed	0-125	-	-	0-125	7	0-126	8	32
10	U-wind	-125 -125	10	125	0-2500	12	0-4094	5	51
11	V-wind	-125 -125	10	125	0-2500	12	0-4094	5	51
12	Temperature	-70 -140	-	70	0-210	8	0-254	7	37
13	6-hr Precip	0-20	1000	-	0-20000	15	0-32766	4	64
14	Max or Min Temp	-70 -130	-	70	0-200	8	0-254	7	37
15	12-hr Precip	0-20	1000	-	0-20000	15	0-32766	4	64
16	Severe Weather	0-5	-	-	0-5	3	0-6	20	13
17	Snow Depth	0-9	-	-	0-9	4	0-14	15	17
								Total	(609)

*A dash indicates the multiplicative constant is one and the additive constant zero.

Special Predictand Tape - Digitized Radar Data

Manually-digitized radar data have been collected from hourly teletype reports and archived in the MOS predictand tape format since November 1, 1973. These data are intended for both general and severe thunderstorm prediction, for developing improved initial moisture fields in TDL numerical models, and for verification of convective weather forecasts. Don Foster, Ron Reap and Harry Akens are primarily responsible for this collection.

The matrix of data consists of 2 columns and 859 rows, each row corresponding to a "box" in the radar grid shown in Fig. VII-1. The grid boxes are roughly 50 nautical miles on a side, i.e., one-fourth of the NMC coarse mesh. The variable in the first column indicates echo intensity and coverage within the box and has possible values from zero through nine, as shown in Fig. VII-2. The second column contains additive data, if any, with values ranging from zero through three. The additive data indicate special echo characteristics associated with severe storms, e.g., line echoes, line-echo-wave patterns, hook echoes, etc.

The archiving program does a limited amount of editing and error checking prior to storing data in the data matrix. Details on the decoding and editing procedures and tape formats are contained in TDL Office Note 73-6 titled, "Archiving of Manually-Digitized Radar Data".

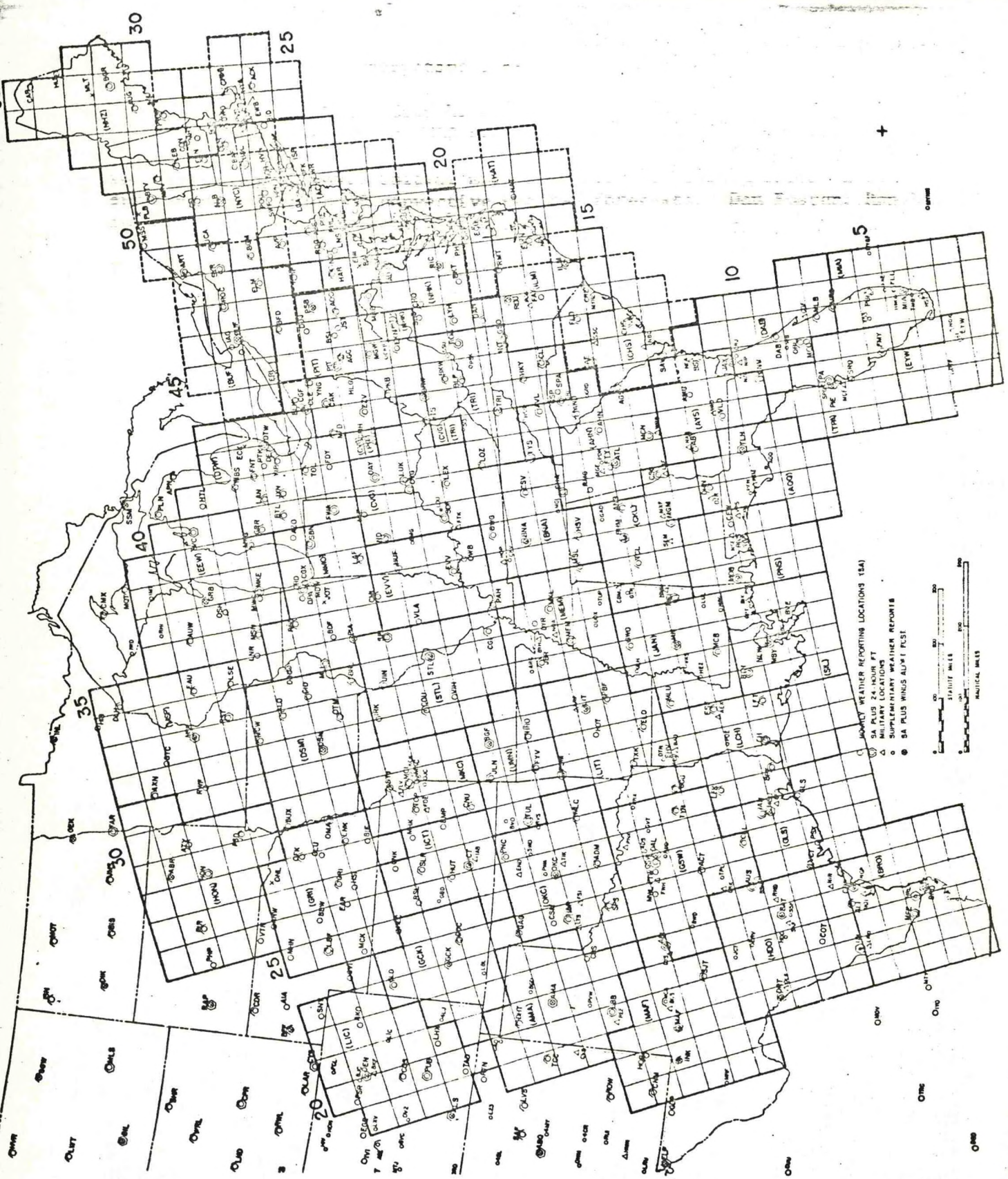


Figure VII-1 - Grid for manually-digitized radar data.

Manually Digitized Radar Data (DR) Code

Code No.	Maximum Observed VIP Level	Coverage in Box	Rainfall Rate in/hr	Intensity Category
0	NO ECHOES			
1	1	ANY VIP1	<.1	Weak
2	2	⩽1/2 of VIP2	.1-.5	Moderate
3	2	>1/2 of VIP2		
4	3	⩽1/2 of VIP3	.5-1	Strong
5	3	>1/2 of VIP3		
6	4	⩽1/2 of VIP3 and 4	1-2	Very Strong
7	4	>1/2 of VIP3 and 4		
8	5 or 6	⩽1/2 of VIP3 4,5 and 6	>2	Intense or Extreme
9	5 or 6	>1/2 of VIP3 4,5 and 6	>2	Intense or Extreme

(IGNORE ADDITIONAL COVERAGE BY WEAK ECHOES FOR ALL DR CODE NUMBERS ABOVE 1. INTENSITY CATEGORIES AND RAINFALL RATES CORRESPOND TO MAXIMUM OBSERVED VIP LEVELS.)

Information on lines and ROML criteria will be handled by adding, when necessary, an additional data group at the end of the line of DR data in the teletype message. A plus (+) sign will precede row and column coordinates of boxes containing echoes which satisfy any of the guidelines for issuing tornado or severe thunderstorm warnings and statements as described in the current ROML on this subject. A minus (-) sign will precede coordinates of boxes which have had, during the immediate past hour, echoes requiring a special RAREP. A solidus(/) will precede coordinates of boxes containing echoes in clearly significant line configuration. Where more than one of these symbols is applicable to a box the order of priority will be: 1) +, 2) -, and 3) /. The coordinates of any box will appear in the added data group at most once and will be added in the order that they appear from left to right, top to bottom, in the station grid. For instance, the third box in the first row (coordinates: 13) would appear before, say, the first box in the third row (coordinates: 31), regardless of whether the coordinates are preceded by +, -, or /.

Sample message: 0001 937' 7254 2210 +21-22/23+31/33

lines

ROML

This indicates that box now coded as 3 had an echo in in the past hour which required a special observation

Figure VII-2 - Manually digitized radar data (DR) code.

PEATMOS to MOS Predictand Tapes Conversion

The PEATMOS predictand data have been converted to the MOS format. The differences are explained below:

1. The station list varies slightly (see PEATMOS to MOS Asheville Data Conversion, in Section VI).

2. Data exist only for hours 0600, 1200, 1800, and 2400 GMT in the PEATMOS sample.

3. DATA(,1) opaque sky cover-- does not exist in the PEATMOS sample. Therefore, this variable set = 9999.

4. DATA(,2) obstruction to vision--the codes and conversion are

PEATMOS		MOS
0	(none of the following)	0
1	(fog)	4
2	(ice fog)	5
3	(ground fog)	6

5. DATA(,3) ceiling--the PEATMOS value of 8888 (unlimited ceiling condition) is set = 888. The PEATMOS value of 7777 (uniform cloud ceiling with height unknown) is set = 777. Otherwise, the code is the same.

6. DATA(,6) observed weather--the conversion is

PEATMOS		MOS
0	(none of the following)	0
1	(snow, hail, or ice pellets)	21
2	(drizzle or freezing drizzle)	2
3	(rain or freezing rain)	5

7. DATA(,16) severe weather--did not exist in PEATMOS sample. Therefore, this variable set = 9999.

8. DATA(,17) snow depth--did not exist in PEATMOS sample. Therefore, this variable set = 9999.

VIII. VARIABLE IDENTIFICATION

Data fields on the grid-point tapes are identified by a leading 5 words as required by the NMC subroutines W3AI00 (packer) and W3AI01 (unpacker). The first two words are used by the MOS system for field identification.

Data fields on the interpolated predictor tapes are also identified by 5 words, as explained in Section V. These identifiers and the correspondence between the grid-point and interpolated formats, together with units and plain language identification, are given in this section. A list, possibly incomplete, of derived fields in the interpolated format is also provided. For consistency, please check with Bob Glahn when identifying new fields.

Finally, correspondence between identifiers for the PEATMOS and MOS formats is provided.

PE VARIABLE IDENTIFICATION FOR MOS SYSTEM

Variable Description	Units	Identification (Octal)			
		Grid-Point Tapes		Interpolated Tapes	
		Word 1	Word 2	(exclusive of tau)	Plain Text
1000 MB HEIGHT	M	0001001002342041XXXX	0000000000000000000	2400010000	1000 HGT
850 MB HEIGHT	M	0001001024601042XXXX	0000000000000000000	2050010000	850 HGT
500 MB HEIGHT	M	0001001014152042XXXX	0000000000000000000	1200010000	500 HGT
1000 MB TEMP.	DEG K	0020001002342041XXXX	0000000000000000000	2400200000	1000 TMP
850 MB TEMP.	DEG K	0020001024601042XXXX	0000000000000000000	2050200000	850 TMP
700 MB TEMP.	DEG K	0020001021056042XXXX	0000000000000000000	1600200000	700 TMP
500 MB TEMP.	DEG K	0020001014152042XXXX	0000000000000000000	1200200000	500 TMP
B.L. POT TEMP.	DEG K	0023022000000000XXXX	0200022002342044000	2250230000	BL POT T
SFC PRESS. (P*)	MB	0010020100000000XXXX	0000000000000000000	2310100000	SFC PRES
B.L. U	M/SEC	0060022000000000XXXX	0200022002342044000	2250700000	BL U
B.L. V	M/SEC	0061022000000000XXXX	0200022002342044000	2250710000	BL V
B.L. VERT. VEL.	MB/SEC	0050022000000000XXXX	0200022002342044000	2250500000	BL VV
REL. HUM. (SFC-490 MB)	PERCENT	0130022110106545XXXX	0200022002342044000	1001300000	MEAN RH
REL. HUM. (B.L.)	PERCENT	0130022000000000XXXX	0200022002342044000	2251300000	BL RH
REL. HUM. (TOP B.L.-700 MB)	PERCENT	0130022120215345XXXX	0200022102342044000	1601300000	L1 RH
REL. HUM. (700 MB-490 MB)	PERCENT	0130022110106545XXXX	0200022120215345000	1011300000	L2 RH
PRECIP. WATER	KG/M^2	0131022110106545XXXX	0200022002342044000	2311310000	P WATER
PRECIP. AMT.	M	0132020100000000XXXX	0003000000000000YYYY	2311320000	P AMT
850 MB U	M/SEC	0060001024601042XXXX	0000000000000000000	2050700000	850 U
850 MB V	M/SEC	0061001024601042XXXX	0000000000000000000	2050710000	850 V
700 MB U	M/SEC	0060001021056042XXXX	0000000000000000000	1600700000	700 U
700 MB V	M/SEC	0061001021056042XXXX	0000000000000000000	1600710000	700 V
500 MB U	M/SEC	0060001014152042XXXX	0000000000000000000	1200700000	500 U
500 MB V	M/SEC	0061001014152042XXXX	0000000000000000000	1200710000	500 V
850 MB VERT. VEL.	MB/SEC	0050001024601042XXXX	0000000000000000000	2050500000	850 VV
650 MB VERT. VEL.	MB/SEC	0050001021056042XXXX	0000000000000000000	1600500000	650 VV
P** TROP. PRESS.	MB	0010020200000000XXXX	0000000000000000000	0260100000	TROP P

NOTE 1: Wind components are on gridpoint tapes with respect to the model grid; they are on interpolated tapes with respect to north.

NOTE 2: XXXX in word 1 of gridpoint tapes is tau (forecast projection)

NOTE 3: YYYY in word 2 of gridpoint tapes (precip. amt.) is interval over which accumulation is taken. This is 6 for tau = 6, 18, etc., and is 12 for tau = 12, 24, etc.

VIII-2

TRAJ VARIABLE IDENTIFICATION FOR MOS SYSTEM

Variable Description	Units	Identification (Octal)			
		Grid-Point Tapes		Interpolated Tapes	
		Word 1	Word 2	(exclusive of tau)	Plain Text
SFC TEMP.	DEG K	00200201000000000030	00000000000000000000	2310200001	SFC TMP
SFC DEW POINT	DEG K	00210201000000000030	00000000000000000000	2310210001	SFC DP
850 MB TEMP.	DEG K	00200010246010420030	00000000000000000000	2050200001	850 TMP
850 DEW POINT	DEG K	00210010246010420030	00000000000000000000	2050210001	850 DP
700 MB TEMP.	DEG K	00200010210560420030	00000000000000000000	1600200001	700 TMP
700 MB DEW POINT	DEG K	00210010210560420030	00000000000000000000	1600210001	700 DP
SFC REL. HUM.	PERCENT	01300201000000000030	00000000000000000000	2311300001	SFC RH
850 MB REL. HUM.	PERCENT	01300010246010420030	00000000000000000000	2051300001	850 RH
700 MB REL. HUM.	PERCENT	01300010210560420030	00000000000000000000	1601300001	700 RH
700-SFC MEAN REL. HUM.	PERCENT	01300010210560420030	02000201000000000000	1611300001	700-S RH
SFC 12-HR NET VERT. DISPL.	MB	00510201000000000030	00030000000000000014	2310510001	SFC 12NVD
850 MB 12-HR NET VERT. DISPL.	MB	00510010246010420030	00030000000000000014	2050510001	850 12NVD
700 MB 12-HR NET VERT. DISPL.	MB	00510010210560420030	00030000000000000014	1600510001	700 12NVD
SFC 24-HR NET VERT. DISPL.	MB	00510201000000000030	00030000000000000030	2312660001	SFC 24NVD
850 MB 24-HR NET VERT. DISPL.	MB	00510010246010420030	00030000000000000030	2052660001	850 24NVD
700 MB 24-HR NET VERT. DISPL.	MB	00510010210560420030	00030000000000000030	1602660001	700 24NVD
700-SFC CNVCTV. INSTAB.	DEG K	01630010210560420030	02000201000000000000	1601630001	CNVCTV I
SFC 12-HR PRECIP. AMT. (12-24 HR)	M	01320201000000000030	00030000000000000014	2311320001	P AMT
SFC 12-HR HORIZ. CVGNG. (12-24 HR)	SEC^{-1}	01120201000000000030	00030000000000000014	2311120001	SFC CONV
850 MB 12-24 HORIZ. CONV. (12-24 HR)	SEC^{-1}	01120010246010420030	00030000000000000014	2051120001	850 CONV
K-INDEX	(NONE)	01620010210560420030	02000010246010420000	1601620001	K INDEX
TOTAL TOTALS INDEX	(NONE)	01610010141520420030	02000010246010420000	1201610001	TT INDEX
500 MB TEMP.	DEG K	00200010141520420030	00000000000000000000	1200200000	500 TMP
B.L. U	M/SEC	00600220000000000030	02000220023420440000	225070000C	BL U
B.L. V	M/SEC	00610220000000000030	02000220023420440000	2250710000	BL V
850 MB U	M/SEC	00600010246010420030	00000000000000000000	2050700000	850 U
850 MB V	M/SEC	00610010246010420030	00000000000000000000	2050710000	850 V
700 MB U	M/SEC	00600010210560420030	00000000000000000000	1600700000	700 U
700 MB V	M/SEC	00610010210560420030	00000000000000000000	1600710000	700 V
500 MB U	M/SEC	00600010141520420030	00000000000000000000	1200700000	500 U
500 MB V	M/SEC	00610010141520420030	00000000000000000000	1200710000	500 V

NOTE 1: Wind components are on gridpoint tapes with respect to the model grid; they are on interpolated tapes with respect to north.

NOTE 2: The last 9 fields are from the PE model, which are saved on the TRAJ tape for convenience.

LFM VARIABLE IDENTIFICATION FOR MOS SYSTEM

Variable Description	Units	Identification (Octal)			
		Grid-Point Tapes		Interpolated Tapes	
		Word 1	Word 2	(exclusive of tau)	Plain Text
REL. HUM. (SFC-490 MB)	PERCENT	0130022110106545XXXX	02000220023420440000	1001300002	MEAN RH
PERCIP. WATER	KG/M2	0131022110106545XXXX	02000220023420440000	2311310002	P WATER
B.L. POT. TEMP.	DEG K	0023022000000000XXXX	02000220023420440000	2250230002	BL POT T
B.L. U	M/SEC.	0060022000000000XXXX	02000220023420440000	2250700002	BL U
B.L. V	M/SEC	0061022000000000XXXX	02000220023420440000	2250710002	BL V
1000 MB HEIGHT	M	0001001002342041XXXX	00000000000000000000	2400010002	1000 HGT
850 MB HEIGHT	M	0001001024601042XXXX	00000000000000000000	2050010002	850 HGT
700 MB HEIGHT	M	0001001021056042XXXX	00000000000000000000	1600010002	700 HGT
500 MB HEIGHT	M	0001001014152042XXXX	00000000000000000000	1200010002	500 HGT
1000 MB TEMP.	DEG. K	0020001002342041XXXX	00000000000000000000	2400200002	1000 TMP
SFC TEMP.	DEG K	0020020100000000XXXX	00000000000000000000	2310200002	SFC TMP
850 MB TEMP.	DEG K	0020001024601042XXXX	00000000000000000000	2050200002	850 TEMP
700 MB TEMP.	DEG K	0020001021056042XXXX	00000000000000000000	1600200002	700 TMP
500 MB. TEMP.	DEG K	0020001014152042XXXX	00000000000000000000	1200200002	500 TMP
850 MB U	M/SEC	0060001024601042XXXX	00000000000000000000	2050700002	850 U
700 MB U	M/SEC	0060001021056042XXXX	00000000000000000000	1600700002	700 U
500 MB U	M/SEC	0060001014152042XXXX	00000000000000000000	1200700002	500 U
200 MB U	M/SEC	0060001004704042XXXX	00000000000000000000	0400700002	200 U
850 MB V	M/SEC	0061001024601042XXXX	00000000000000000000	2050710002	850 V
700 MB V	M/SEC	0061001021056042XXXX	00000000000000000000	1600710002	700 V
500 MB V	M/SEC	0061001014152042XXXX	00000000000000000000	1200710002	500 V
200 MB V	M/SEC.	0061001004704042XXXX	00000000000000000000	0400710002	200 V
850 MB VERT. VEL.	MB/SEC.	0050001024601042XXXX	00000000000000000000	2050500002	850 VV
650 MB VERT. VEL.	MB/SEC	0050001021056042XXXX	00000000000000000000	1600500002	650 VV
500 MB VERT. VEL.	MB/SEC	0050001014152042XXXX	00000000000000000000	1200500002	500 VV
PRECIP. AMT.	M	0132020100000000XXXX	00030000000000YYYY	2311320002	P AMT
SFC PRESS. (P*)	MB	0010020100000000XXXX	00000000000000000000	2310100002	SFC PRES
REL. HUM. (B.L.)	PERCENT	0130022000000000XXXX	02000220023420440000	2251300002	BL RH
REL. HUM. (TOP B.L.-700 MB)	PERCENT	0130022120215345XXXX	02000221023420440000	1601300002	L1 RH
REL. HUM. (700 MB - 490 MB)	PERCENT	0130022110106545XXXX	02000221202153450000	1011300002	L2 RH
1000 MB DEW POINT	DEG. K	0021001002342041XXXX	00000000000000000000	2400210002	1000 DP
850 MB DEW POINT	DEG. K	0021001024601042XXXX	00000000000000000000	2050210002	850 DP
700 MB DEW POINT	DEG K	0021001021056042XXXX	00000000000000000000	1600210002	700 DP
500 MB DEW POINT	DEG K	0021001014152042XXXX	00000000000000000000	1200210002	500 DP
SEA LEVEL PRESS.	MB	0010020000000000XXXX	00000000000000000000	2410100002	SL PRES
B.L. VERT. VEL.	MB/SEC.	0050022000000000XXXX	02000220023420440000	2250500002	BL VV

NOTE 1: Wind components are on gridpoint tapes with respect to the model grid; they are on interpolated tapes with respect to north.

NOTE 2: XXXX in word 1 of gridpoint tapes is tau (forecast projection).

NOTE 3: YYYY in word 2 of gridpoint tapes (precip. amt.) is interval over which accumulation is taken. This is 6 for tau = 6, 18, etc., and is 12 for tau = 12, 24, etc.

PBL VARIABLE IDENTIFICATION FOR MOS SYSTEM

Variable Description	Units	Indentification (Octal)			
		Grid-Point Tapes		Interpolated Tapes	
		Word 1	Word 2	(exclusive of tau)	Plain Text
50M U	CM/SEC.	0060000614152043XXXX	0000000000000000000	2300700004	50M U
150M U	CM/SEC.	0060000603523042XXXX	0000000000000000000	2270700004	150M U
300M U	CM/SEC.	0060000607246042XXXX	0000000000000000000	2260700004	300M U
600M U	CM/SEC.	0060000616514042XXXX	0000000000000000000	2240700004	600M U
900M U	CM/SEC.	0060000625762042XXXX	0000000000000000000	2210700004	900M U
1200M U	CM/SEC.	0060000602734041XXXX	0000000000000000000	2100700004	1200M U
1600M U	CM/SEC.	0060000603720041XXXX	0000000000000000000	2030700004	1600M U
50M V	CM/SEC.	0061000614152043XXXX	0000000000000000000	2300710004	50M V
150M V	CM/SEC.	0061000603523042XXXX	0000000000000000000	2270710004	150M V
300M V	CM/SEC.	0061000607246042XXXX	0000000000000000000	2260710004	300M V
600M V	CM/SEC.	0061000616514042XXXX	0000000000000000000	2240710004	600M V
900M V	CM/SEC.	0061000625762042XXXX	0000000000000000000	2210710004	900M V
1200M V	CM/SEC.	0061000602734041XXXX	0000000000000000000	2100710004	1200M V
1600M V	CM/SEC.	0061000603720041XXXX	0000000000000000000	2030710004	1600M V
50M SPECIFIC LIQ.	(NONE)	0140000614152043XXXX	0000000000000000000	2301400004	50M SLQ
150M SPECIFIC LIQ.	(NONE)	0140000603523042XXXX	0000000000000000000	2271400004	150M SLQ
300M SPECIFIC LIQ.	(NONE)	0140000607246042XXXX	0000000000000000000	2261400004	300M SLQ
600M SPECIFIC LIQ.	(NONE)	0140000616514042XXXX	0000000000000000000	2241400004	600M SLQ
1200M SPECIFIC LIQ.	(NONE)	0140000602734041XXXX	0000000000000000000	2101400004	1200M SLQ
50M FRICTION VERT. VEL.	CM/SEC.	0053000614152043XXXX	0000000000000000000	2300530004	50M FVV
150M FRICTION VERT. VEL.	CM/SEC.	0053000603523042XXXX	0000000000000000000	2270530004	150M FVV
300M FRICTION VERT. VEL.	CM/SEC.	0053000607246042XXXX	0000000000000000000	2260530004	300M FVV
600M FRICTION VERT. VEL.	CM/SEC.	0053000616514042XXXX	0000000000000000000	2240530004	600M FVV
1200M FRICTION VERT. VEL.	CM/SEC.	0053000602734041XXXX	0000000000000000000	2100530004	1200M FVV
50M TERRAIN VERT. VEL.	CM/SEC.	0052000614152043XXXX	0000000000000000000	2300520004	50M TVV
150M TERRAIN VERT. VEL.	CM/SEC.	0052000603523042XXXX	0000000000000000000	2270520004	150M TVV
300M TERRAIN VERT. VEL.	CM/SEC.	0052000607246042XXXX	0000000000000000000	2260520004	300M TVV
600M TERRAIN VERT. VEL.	CM/SEC.	0052000616514042XXXX	0000000000000000000	2240520004	600M TVV
1200M TERRAIN VERT. VEL.	CM/SEC.	0052000602734041XXXX	0000000000000000000	2100520004	1200M TVV
SFC SPECIFIC HUM.	(NONE)	0137000600000000XXXX	0000000000000000000	2311370004	SFC S H
50M SPECIFIC HUM.	(NONE)	0137000614152043XXXX	0000000000000000000	2301370004	50M S H
150M SPECIFIC HUM.	(NONE)	0137000603523042XXXX	0000000000000000000	2271370004	150M S H
300M SPECIFIC HUM.	(NONE)	0137000607246042XXXX	0000000000000000000	2261370004	300M S H
600M SPECIFIC HUM.	(NONE)	0137000616514042XXXX	0000000000000000000	2241370004	600M S H
900M SPECIFIC HUM.	(NONE)	0137000625762042XXXX	0000000000000000000	2211370004	900M S H
1200M SPECIFIC HUM.	(NONE)	0137000602734041XXXX	0000000000000000000	2101370004	1200M S H
1600M SPECIFIC HUM.	(NONE)	0137000603720041XXXX	0000000000000000000	2031370004	1600M S H
SFC TEMP.	DEG. K	0020000600000000XXXX	0000000000000000000	2310200004	SFC TMP
50M TEMP.	DEG. K	0020000614152043XXXX	0000000000000000000	2300200004	50M TMP
150M TEMP.	DEG. K	0020000603523042XXXX	0000000000000000000	2270200004	150M TMP
300M TEMP.	DEG. K	0020000607246042XXXX	0000000000000000000	2260200004	300M TMP
600M TEMP.	DEG. K	0020000616514042XXXX	0000000000000000000	2240200004	600M TMP
900M TEMP.	DEG. K	0020000625762042XXXX	0000000000000000000	2210200004	900M TMP
1200M TEMP.	DEG. K	0020000602734041XXXX	0000000000000000000	2100200004	1200M TMP
1600M TEMP.	DEG. K	0020000603720041XXXX	0000000000000000000	2030200004	1600M TMP
RATIO SFC WIND/50M WIND	(NONE)	0072000614152043XXXX	0200000600000000000	2310720004	WND RATIO

NOTE 1: Wind components are on gridpoint tapes with respect to the model grid; they are on interpolated tapes with respect to north.

NOTE 2: XXXX in word 1 of gridpoint tapes is tau (forecast projection).

VIII-5

SUM VARIABLE IDENTIFICATION FOR MOS SYSTEM

Variable Description	Units	Identification (Octal)			
		Grid-Point Tapes		Interpolated Tapes	
		Word 1	Word 2	(exclu. of tau)	Plain Text
1000 MB HEIGHT	M	0001001002342041XXXX	0000000000000000000	2400010003	1000 HGT
MEAN REL. HUM. (1000-500 MB)	PERCENT	0130001014152042XXXX	0200001002342041 0000	1001300003	MEAN RH
MEAN SP. HUM. (1000-500 MB)	DIMENSIONLESS	0137001014152042XXXX	0200001002342041 0000	1001370003	MEAN SH
PRECIP. AMT.	M	0132020100000000XXXX	0003000000000000YYYY	2311320003	P AMT
CEILING	FT/100	0263000000000000XXXX	0000000000000000000	2312630003	CEILING
VISIBILITY	MI	0264020100000000XXXX	0000000000000000000	2312640003	VSBY
SKY COVER	CODED	0246000000000000XXXX	0000000000000000000	2312620003	SKY COVER

NOTE 1: XXXX in word 1 of gridpoint tapes is tau (forecast projection)

NOTE 2: YYYY in word 2 of gridpoint tapes (precip. amt.) is interval over which accumulation is taken. This is 2 for the 2-hr projection and 3 for all other projections.

VIII-6

Form of Hourly Data on Interpolated Predictor Tapes

The hourly observations saved on the SUM Collection are unpacked by the MOS "Interpolation" Program and put into the same format as the data interpolated from the grid-point fields. The variables to be provided, upon request, on the interpolated tapes are:

6-digit Identifier (Octal)	Variable	Units	Comments
2000100003	Sea Level Pressure	mb	
2010200003	Temperature	deg F	(Not standard NMC units)
2010210003	Dew Point	deg F	(" " " ")
2010620003	Wind Speed	knots	(" " " ")
2010670003	Wind Direction	degrees	With respect to North
2010700003	U-wind	knots	" " " " (Positive=wind from West) (Not standard NMC units)
2010710003	V-wind	knots	With respect to North (Positive=wind from South) (Not standard NMC units)
2012600003	Weather	(Table 1)	
2012610003	Severe Weather	(Table 2)	
2012620003	Sky Cover	(Table 3)	
2012630003	Ceiling Height	Hundreds of ft.	Unlimited=777
2012640003	Visibility	miles	
2012650003	Obstructions to Vision	(Table 4)	

The first three digits of each identifier denote the level and the next three denote the data type (See NMC Office Note 28). The seventh and eighth digits (00) indicate this is an unmodified variable and the ninth and tenth (03) indicate this variable comes from the SUM Collection.

Any missing value is indicated by 9999.

Table 1.--Weather

Value	Description	Value	Description
0	None of below	13	ZR-,ZR--
1	L-,L--	14	ZR
2	L	15	ZR+
3	L+	16	Any combination of frozen and liquid precipitation
4	R-,R--	17	IP-,IP--,IPW-,IPW--
5	R	18	IP,IPW
6	R+	19	IP+,IPW+
7	RW-,RW--	20	S-,S--,SP-,SP--,SG-,SG--
8	RW	21	S,SP,SG
9	RW+	22	S+,SP+,SG+
10	ZL-,ZL--	23	SW-,SW--
11	ZL	24	SW
12	ZL+	25	SW+

Table 2.--Severe Weather

Value	Description
0	None of below
1	T (Thunderstorm)
2	T+ (Severe Thunderstorm)
3	A (Hail)

Table 3.--Sky Cover

Value	Description	Value	Description
0	Clear	5.	Scattered
1	Partial Obscuration	6	Broken
2	Thin Scattered	7	Overcast
3	Thin Broken	8	Obscured
4	Thin Overcast		

Table 4.--Obstruction to Vision

Value	Description
0	None of below
1	K
2	H
3	KH
4	F
5	IF
6	GF

DERIVED VARIABLE IDENTIFICATION FOR MOS SYSTEM

Integers 1, 2, and 3 in the low order position of the two modification digits (digits 7 and 8) are reserved for smoothing operators defined on the grid used by the model specified by the last two digits (9 and 10) of the 10 digit identification:

1 = 5-pt smoother
2 = 9-pt smoother
3 = 25-pt smoother

Integers 1, 2, 3, and 4 in the high order position of the two modification digits are reserved for time difference operators:

1 = $t_o - t_{-6}$
2 = $t_o - t_{-12}$
3 = $t_o - t_{-18}$
4 = $t_o - t_{-24}$

Combinations such as 12 in 2050011200 would mean the time difference field $t_o - t_{-6}$ of 850-mb height from the PE model smoothed with the 9-point operator on the PE grid. (Time difference done first, then smoothing.)

Thirteen variables taken from the hourly aviation report, and saved by the SUM Model are defined in "Form of Hourly Data on Interpolated Predictor Tapes."

DERIVED VARIABLES

Variable Description	MOS Identification (exclusive of tau)	Plain Text*	Units	Remarks
WIND DIRECTION CLOCKWISE WITH RESPECT TO NORTH	XXX067XXXX	MM XXX W DIR	DEGREES	
SINE OF DAY OF YEAR	000400XX00	MM SIN DOY	-	Use 00 for model designation
COSINE OF DAY OF YEAR	000401XX00	MM COS DOY	-	Use 00 for model designation
12-HR NET VERTICAL DISPLACEMENT	XXX051XXXX	MM XXX 12NVD	MB	
24-HR VERTICAL DISPLACEMENT	XXX266XXXX	MM XXX 24NVD	MB	
TOTAL-TOTALS INDEX	120161XXXX	MM TT INDEX	-	MOS = PEATMOS
K-INDEX	160162XXXX	MM K INDEX	-	MOS = PEATMOS
G-INDEX ($=H_{10}+H_5-2*H_{8.5}$)	205163XXXX	MM G INDEX	M	MOS = .01 PEATMOS - 2771
SINE OF DAY OF YEAR*2	0004020000	MM SIN 2*DOY	-	
COSINE OF DAY OF YEAR*2	0004030000	MM COS 2*DOY	-	
GEOSTROPHIC WIND SPEED	XXX662XXXX	MM XXX GEO S	M/SEC	
GEOSTROPHIC WIND, U	XXX670XXXX	MM XXX GEO U	M/SEC	
GEOSTROPHIC WIND, V	XXX671XXXX	MM XXX GEO V	M/SEC	
RELATIVE VORTICITY	XXX111XXXX	MM XXX R VOR	-	
850 MB TEMP. MINUS 1000 MB TEMP.	210420XXXX	MM 850T-1000T	DEG K	
AVERAGE STATION PRESSURE	2311150000	MM PRESS HGT	MB	
700 MB TEMP. MINUS 850 MB TEMP.	175420XXXX	MM 700T-850T	DEG K	

*MM is used to designate model
XXX is used to designate level

PEATMOS TO MOS INTERPOLATED TAPES CONVERSION

Variable Description*	Source	Identification PEATMOS	Identification MOS (exclusive of tau)	Identification MOS Plain Text	Units PEATMOS	Units MOS	PEATMOS to MOS Conversion Factors** C	PEATMOS to MOS Conversion Factors** A
SURFACE TEMP.	TRAJ	231120	2310200001	SFC TMP	DEG C	DEG K	1	273.15
SURFACE DEW POINT	"	231121	2310210001	SFC DP	DEG C	DEG K	1	273.15
850 MB TEMP.	"	205120	2050200001	850 TMP	DEG C	DEG K	1	273.15
850 MB DEW POINT	"	205121	2050210001	850 DP	DEG C	DEG K	1	273.15
700 MB TEMP.	"	160120	1600200001	700 TMP	DEG C	DEG K	1	273.15
700 MB DEW POINT	"	160121	1600210001	700 DP	DEG C	DEG K	1	273.15
700 MB 12-HR NET VERT. DISPL.	"	160142	1600510001	700 12NVD	MB	MB	1	0
700 MB REL. HUM.	"	160104	1601300001	700 RH	PERCENT	PERCENT	1	0
SFC REL. HUM.	"	231104	2311300001	SFC RH	PERCENT	PERCENT	1	0
850 MB REL. HUM.	"	205104	2051300001	850 RH	PERCENT	PERCENT	1	0
700-SFC MEAN REL. HUM.	"	070104	1611300001	700-S RH	PERCENT	PERCENT	1	0
SFC 12-HR NET VERT. DISPL.	"	231142	2310510001	SFC 12NVD	MB	MB	1	0
850 MB 12-HR NET VERT. DISPL.	"	205142	2050510001	850 12NVD	MB	MB	1	0
SFC 24-HR NET VERT. DISPL.	"	231144	2312660001	SFC 24NVD	MB	MB	1	0
850 MB 24-HR NET VERT. DISPL.	"	205144	2052660001	850 24NVD	MB	MB	1	0
700 MB 24-HR NET VERT. DISPL.	"	160144	1602660001	700 24NVD	MB	MB	1	0
SFC 6-HR NET VERT. DISPL.	"	231140		SFC 6NVD	MB	MB	1	0
850 MB 6-HR NET VERT. DISPL.	"	205140		850 6NVD	MB	MB	1	0
700 MB 6-HR NET VERT. DISPL.	"	160140		700 6NVD	MB	MB	1	0
700-SFC CNVCTV. INSTAB.	"	070150	1601630001	CNVCTV I	DEG C	DEG K	1	0
850 MB NET VERT. VEL. (12-24 HR)	"	205147		850 12NVV	MB	MB	1	0
SFC 12-HR PRECIP. AMT. (12-24 HR)	"	231130	2311320001	P AMT	INCHES	M	.0254	0
SFC 12-HR HORIZ. CVGNC.	"	231146	2311120001	SFC CONV	SEC^{-1}	SEC^{-1}	1	0
850 MB 12-HR HORIZ. CVGNC.	"	205146	2051120001	850 CONV	SEC^{-1}	SEC^{-1}		
1000 MB HEIGHT	PE	240001	2400010000	1000 HGT	GM DEPART	M	.01	113
850 MB HEIGHT	"	205001	2050010000	850 HGT	GM DEPART	M	.01	1457
500 MB HEIGHT	"	120001	1200010000	500 HGT	GM DEPART	M	.01	5572
1000 MB TEMP.	"	240020	2400200000	1000 TMP	DEG C	DEG K	1	273.15
850 MB TEMP.	"	205020	2050200000	850 TMP	DEG C	DEG K	1	273.15
700 MB TEMP.	"	160020	1600200000	700 TMP	DEG C	DEG K	1	273.15
500 MB TEMP.	"	120020	1200200000	500 TMP	DEG C	DEG K	1	273.15
B.L. POT. TEMP.	"	225106	2250230000	BL POT T	DEG C	DEG K	1	273.15
SFC PRESS. (P*)	"	231110	2310100000	SFC PRES	CB DEPART	MB	10	900
B.L. U	"	225060	2250700000	BL U	M/SEC	M/SEC	1	0
B.L. V	"	225061	2250710000	BL V	M/SEC	M/SEC	1	0
B.L. VERT. VEL.	"	225005	2250500000	BL VV	MICROB/SEC	MB/SEC	.001	0
REL. HUM. (SFC-490 MB)	"	100104	1001300000	MEAN RH	PERCENT	PERCENT	1	0
REL. HUM. (B.L.)	"	225104	2251300000	BL RH	PERCENT	PERCENT	1	0
REL. HUM. (TOP B.L.-700 MB)	"	161104	1601300000	L1 RH	PERCENT	PERCENT	1	0
REL. HUM. (700 MB-490 MB)	"	101104	1011300000	L2 RH	PERCENT	PERCENT	1	0
PRECIP. WATER	"	100105	2311310000	P WATER	IN X 10^2	KG/M^2	.2540	0
PRECIP. AMT.	"	231041	2311320000	P AMT	IN X 10^2	M	.000254	0
850 MB U	"	205060	2050700000	850 U	KTS	M/SEC	.51479	0
850 MB V	"	205061	2050710000	850 V	KTS	M/SEC	.51479	0
700 MB U	"	160060	1600700000	700 U	KTS	M/SEC	.51479	0
700 MB V	"	160061	1600710000	700 V	KTS	M/SEC	.51479	0
500 MB U	"	120060	1200700000	500 U	KTS	M/SEC	.51479	0
500 MB V	"	120061	1200710000	500 V	KTS	M/SEC	.51479	0
1000 MB VERT. VEL.	"	240005	2400500000	1000 VV	MICROB/SEC	MB/SEC	.001	0
850 MB VERT. VEL.	"	205005	2050500000	850 VV	MICROB/SEC	MB/SEC	.001	0
650 MB VERT. VEL.	"	145005	1600500000	650 VV	MICROB/SEC	MB/SEC	.001	0

* All wind components are with respect to north, not the model grid
** MOS = PEATMOS*C+A

Plain Language Identification

The interpolated predictor tapes contain 15 characters of plain language identification (words 3 and 4). This is for ease of interpretation on printout.

The folloring format is used by programs M200 and M400. It should also be used when new predictors are derived and input is supplied to M200:

Digits

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
P	E												S	5
T	J												S	9
L	M													
B	L											S	2	5
S	M													

Model (2) — Blank — Variable Name (8) — Blank — Smoothing (3)

The 5 models currently in use are identified as shown (PE=6-layer NMC PE, TJ=trajectory, LM=LFM, BL=PBL, SM=SUM). The 3 smoothers being used are 5-point (S5), 9-point (S9), and 25-point (S25). If necessary the blank digit 12 can be used as part of the name.

IX. FORMAT OF MOS EQUATIONS ON CARDS

Equations will be either (A) generalized operator (apply to more than one point or station) or (B) single station (apply to a single point or station). In either case, the equation will consist of (1) a first card containing the equation constant and certain other information (see below), and (2) additional cards, each containing two predictors and the associated coefficient, etc., except the last of these cards can contain only one predictor. The constant, coefficients, etc. will be compatible with the units used on the NMC permanent files.

A. Generalized Operator Equations

(1) Card 1 - Format (I3,5X,I4,E12.5)

Word 1 - NSTA = Number of stations for which this equation applies
Word 2 - NTMS = Number of predictors in equation
Word 3 - CNST = Equation constant

(2) Additional Cards - Format (2(O10,I4,2E12.5))

Word 1 - IDNT( ) = First predictor identifier (10 digit). See "Format of MOS Interpolated Predictor Tapes" for description of predictor identifier. These 10 digits are the yyyxxxmmff in Word 1.
Word 2 - NTIME( ) = First predictor projection (tau) in hours.
Word 3 - CAT( ) = Upper limit of first predictor, if binary. Set = 9999. if predictor is not binary.
Word 4 - COEF( ) = Coefficient of first predictor.

Repeat for 2nd predictor.

B. Single Station Equations

(1) Card 1 - Format (I3,I5,I4,E12.5,2A10)

Word 1 - NSTA = 1
Word 2 - LWBAN = 5-digit station number
Word 3 - NTMS = Number of predictors in equation
Word 4 - CNST = Equation constant
Word 5 - NAME(1) = First 10 characters of station name.
Word 6 - NAME(2) = Second 10 characters of station name.

(2) Additional Cards

Same as for Generalized Operator Equations.

Note that NSTA, NTMS, and CNST occupy the same columns for both generalized operator and single station equations.

Cards in this format can be produced by program M600 and M600W.

X. REFERENCES

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