

III.9-MAPE MEAN AREAL POTENTIAL EVAPORATION PROGRAM (MAPE)

Purpose

The Mean Areal Potential Evaporation (MAPE) program provides techniques and procedures used to for computing estimates of mean areal potential evaporation from station potential evaporation data.

Chapter III.2 describes how to obtain the historical station evaporation data.

Program MAPE can be used to:

1. Calculate station weights using the grid point weighting procedure described in Chapter II.6.
2. Check the consistency of the potential evaporation data by comparing the accumulated data at an individual station to the accumulated data for a group of neighboring stations.
3. Estimate potential evaporation at dummy stations (hypothetical stations with all missing data). Dummy stations can be used to represent parts of basins for which no data is available.
4. Estimate missing data using the distance and elevation weighting procedure described in Chapter II.7. The program uses monthly normals input by the user to estimate days for which all stations have missing data.
5. Check the accuracy of the data estimating procedure at a given station.
6. Distribute accumulated data. The program distributes accumulated values evenly. It treats accumulated values greater than 1 inch and values accumulated for more than 1 week as missing data.
7. Adjust the potential evaporation data to account for consistency changes.
8. Shift the potential evaporation data to account for observation time changes. The program assumes that if an observation time of 12 or less is input, the data applies to the day before it is recorded and shifts the data accordingly.
9. Calculate estimates of mean areal potential evapotranspiration using either input or computed station weights.

Program MAPE is currently dimensioned for the following maximums:

- o 10 basins
- o 25 evaporation stations
- o 10 changes in observation time per station
- o 10 adjustments to evaporation per station
- o 25 years

- o 5 groups of stations for a consistency check

Input Data

<u>Card</u>	<u>Format</u>	<u>Columns</u>	<u>Contents</u>
1	3X,I2	4-5	First month
	1X,I4	7-10	First year (four digits)
	3X,I2	14-15	Last month
	1X,I4	17-20	Last year (four digits)
	3X,I2	24-25	Number of stations
	3X,I2	30	Number of areas where MAPE is to be computed (maximum is 10): 0 = evaporation check run or consistency check run without computing MAPE
	4X,I1	35	Option for printing daily evaporation data for each station: 0 = do not print data 1 = print data after it has been adjusted and shifted 2 = print data after it has been adjusted and shifted and again after the missing data has been estimated; 2000.0 is added to the estimated values to indicate which values have been estimated
	1X,A4	37-40	Units option: 'MM ' = millimeters 'IN ' = inches
	3A4	41-52	Name of Forecast Group; this name will become part of the directory name into which MAPE results will be written; embedded blanks are not allowed; if blank a Forecast Group name will not be part of the full pathname
	3X,I1	56	Option for evaporation adjustments: 0 = no evaporation adjustments 1 = evaporation adjustment required for some stations
	I4	57-60	Sequence number of station to be estimated with the Evaporation Estimation Procedure Check; an Evaporation Estimation Check cannot be made simultaneously with a consistency check and/or MAPE run

<u>Card</u>	<u>Format</u>	<u>Columns</u>	<u>Contents</u>
	3X,I1	64	MAPE output option: 0 = print MAPE but do not write MAPE into data file 1 = print MAPE and write MAPE into data file 2 = do not print MAPE but write MAPE into data file
	3X,I1	68	Not used
	3X,I1	72	Station weighting option: 0 = input predetermined station weights for each station 1 = compute grid point weights for each station
	2X,I2	75-76	First month of winter season (must be less than or equal to 12)
	2X,I2	79-80	First month of summer season (must be greater than or equal to 2 and less than first month of winter)
2	F6.2	1-6	Distance between MAPE grid coordinates in units of KM

Repeat cards 3 and 4 for each evaporation station. Input order determines station sequence number. Dummy stations may be placed anywhere.

3	5A4	1-20	Station name
	F5.0	21-25	X grid coordinate
	F5.0	26-30	Y grid coordinate
			Square grid system of any orientation is used; basins must fall within basic 80 by 80 grid; stations may be outside this grid
	I5	31-35	State number
	I5	36-40	Station number (must be less than 9999); for a dummy station use a number greater than 9999
	F5.0	41-45	Observation time (hour 1 through 24) for initial month; enter 24 for synoptic stations; if a value of 12 or less is input then the program assumes that the PE applies to the preceding day and shifts the data accordingly

<u>Card</u>	<u>Format</u>	<u>Columns</u>	<u>Contents</u>
	F10.0	46-55	Station elevation in units of M
	F5.0	56-60	Elevation weighting factor (FE) (see Chapter II.7 for a discussion of FE as it applies to maximum-minimum temperature data)
4	5A4	1-20	Station name (optional)
	12F5.0	21-80	Mean daily evaporation for each month (January through December)

Omit cards 5 through 7 when MAPE is not being computed.

Repeat cards 5 through 7 for each area for which MAPE is to be computed.

5	5A4	1-20	Area name
	3X,3A4	24-35	Area identifier
	3X,3A4	39-50	Basin name (optional); if specified then this name will become part of the directory name and file name into which MAPE results will be written (./basin_name/basin_name.MAPE); if omitted then the area identifier is used as part of the filename and the additional directory level is omitted (./area_id.MAPE) <u>1/</u> <u>2/</u>
	3X,3A4	54-65	File name (optional); if specified then the MAPE output will be written to that file (./basin_name/file_name.MAPE); if omitted then the file name will be set to the basin name <u>1/</u> <u>2/</u>

Card 6 is needed only for predetermined station weights.

Repeat card 6 if there are more than 16 stations.

6	16F5.3	1-80	Predetermined weight for each station; station order is determined by the sequence numbers
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Card group 7 is needed only if grid point weights are to be calculated. 80 cards are needed to define the grid map of the area. Grid points in the area are indicated with a 1. Grid points not in the area are left blank.

7	80I1	1-80	Area grid map; 80 cards one Y ordinate per card; first card is for Y=80, second card for Y=79, ... last card for Y=1; if cards
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Card Format Columns Contents

are listed the listing should look similar to the shape of the area

Card group 8A is needed only if there are changes in observation time at some stations. A maximum of 10 changes can be made for each station. 3/

8A	I5	1-5	Station sequence number
	3X,I2	9-10	Month number of observation time change
	1X,I4	12-15	Year (four digits)
	F5.0	19-20	New observation time (hour 1 through 24)

Card 8B must always be included even if there are no cards 8A.

8B	3X,I2	4-5	'99'
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Card group 9A is needed only if adjustments are to be made to evaporation data. A maximum of 10 changes can be made for each station. 4/

9A	I5	1-5	Station sequence number
	3X,I2	9-10	Month when correction starts
	1X,I4	12-15	Year (four digits)
	F5.0	16-20	Evaporation adjustment factor
	1X,A4	22-25	Season in which evaporation adjustment factor is to be applied: 'W ' = winter 'S ' = summer ' ' = winter and summer

Card 9B is needed only if there is at least one card 9A.

9B	3X,I2	4-5	'99'
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Repeat card 10 for each station.

10			Station time series input file information <u>5/</u>
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Card 11 is needed only when an evaporation estimation check is run.

11	F5.0	1-5	EMAX; when the estimated PE varies more than EMAX from the observed, a message is printed; suggested initial value is 1.5 MM (0.06 IN)
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Card Format Columns Contents

Cards 12 and 13 are needed only if a consistency check is to be made.

12	4X,I1	5	0 = no consistency check 1 = consistency check using all data 2 = consistency check on a seasonal basis
	4X,I1	10	Number of groups (maximum is 5)
	5I5	11-35	Number of stations in each group

Repeat card 13 for each group.

13	16I5	1-80	Sequence number of each station in the group <u>6</u> /
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Card group 14 is needed if different values of FE (one value per card) are to be entered for the dummy station. For each entry the program will recycle and print new results.

14	F10.5	1-10	FE value for evaporation at a dummy station (see Chapter II.7 for a discussion of FE as it applies to max-min temperature data)
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Notes:

1/ If the Forecast Group directory name is blank then a Forecast Group name will not be part of the full pathname.

The full pathname is created by concatenating the Forecast Group directory name to a pathname generated by apps_defaults tokens (see Chapter I.2-UNIX-CALB). The directory defined by this full pathname must be created by the user.

2/ The characters 'MAPE' are appended to the basin name or area identifier to create the full file name. The maximum length of the full pathname plus the file name is 112 characters.

3/ Time changes for each station must be in order by date (earliest first). All changes for one station can be first followed by the changes for the next station, etc., or all the changes for the first month at all stations can be followed by changes in subsequent months.

If a value of 12 or less is input then the program assumes that the PE applies to the day before it was recorded and shifts the data accordingly.

4/ Adjustment to each station must be in order by date (earliest first) as with card group 8A (one adjustment per card). The adjustment remains in effect until the date of the next adjustment. In most cases, the earlier portion of the record should be adjusted to conform to the most recent portion.

5/ Include one card for each station using the following format:

<u>Columns</u>	<u>Format</u>	<u>Contents</u>
1-12	3A4	File name
14-17	1X,A4	'PTPE'

See Chapter I.2-UNIX-CALB for a description of the directory structure.

Station input file information cards must be in order by station sequence numbers except that no file information cards are to be provided for dummy stations.

6/ Every station must be in a group. However no station can be in more than one group.

Stations with positive sequence numbers make up the group base and are plotted against the other stations in the group base. Stations with negative sequence numbers are plotted against the group base. Station order does not matter.

For example Group 1 consists of 5 stations. Sequence numbers are 3, 5, 6, 9 and 12. Card 13 input for group 1 is:

```
6 5 9 -12 -3
```

The group base consists of stations 6, 5 and 9. Station 6 is plotted against the average of stations 5 and 9, station 5 against the average of 6 and 9, station 9 against the average of 5 and 6. Stations 12 and 3 are plotted against the average of the group base.

Output Data

The program allows the user to make three types of runs: MAPE, consistency check and evaporation estimation check. A MAPE run and a consistency check run may be made simultaneously but an evaporation estimation check run may not be made with a MAPE run or a consistency check run.

Mean areal potential evaporation values may be printed, written to the a data file or both printed and written to a data file.

The daily station potential evaporation data may be printed after the data have been adjusted and shifted and again after the missing data have been estimated.

Program Execution Information

See Chapter I.2 for information about how to execute the program.

Sample Input and Output

Figure 1 is sample program input.

Figure 2 is sample program output.

Figure 1. Sample input for program MAPE

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          - Column -
      5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
10 1964   9 1976   2   1   1 MM serfc   0   0   1   1   0  11   3
1.78
RALEIGH           63  -6   31 7069   24           132.   1.
RALEIGH           1.0  1.5  2.2  3.3  3.8  4.4   4.2  3.6  3.0  2.1  1.5  1.0
CHAPEL HILL       46  -3   31 1677   8           152.   1.
CHAPEL HILL       .19  .86  1.92  3.2  3.42  3.62  3.61  3.51  2.95  2.13  1.16  0.63
NEUSE R. AT NRTHSIDE STATION ID      neuse_river      neuse_upper
.410 .590
99
Raleigh,NC_P PTPE
ChapelHill,N PTPE

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Figure 2. Sample output from program MAPE

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NWSRFS CALIBRATION SYSTEM - PROGRAM MAPE      (VERSION: 3.3.8   - 04/07/99)      DATE=Apr 19, 1999 - 14:34:42

      MEAN AREAL POTENTIAL EVAPORATION      FROM 10/1964 THROUGH  9/1966

NOV. IS THE FIRST MONTH OF WINTER.      MAR. IS THE FIRST MONTH OF SUMMER.

- - CORRECTION FACTORS ARE APPLIED DURING THE SEASON INDICATED ONLY - -
  IF WINTER OR SUMMER IS NOT INDICATED, THE FACTOR IS APPLIED TO ALL DATA

      STATION MEANS ARE USED TO ESTIMATE MISSING DATA      GRID LENGTH=  1.7800 KILOMETERS

STA. RUN NO.      STATION NAME      X      Y      NWS STA. NO.      ELEVATION-M.      FE

      1      RALEIGH      63.  -6.      31- 7069      132.      1.0
      MEANS      JAN-DEC      1.000 1.500 2.200 3.300 3.800 4.400 4.200 3.600 3.000 2.100 1.500 1.000

      2      CHAPEL HILL      46.  -3.      31- 1677      152.      1.0
      MEANS      JAN-DEC      .190 .860 1.920 3.200 3.420 3.620 3.610 3.510 2.950 2.130 1.160 .630

STATION WEIGHTS FOR NEUSE_R_ AT_NRTHSIDE      ID=NUESE@NTHSID      basin name=neuse_river      basin zone=neuse_upper

      RALEIGH      .410
      CHAPEL HILL      .590

- - CORRECTION FACTORS ARE APPLIED DURING THE SEASON INDICATED ONLY - -
  IF WINTER OR SUMMER IS NOT INDICATED, THE FACTOR IS APPLIED TO ALL DATA

      UNITS USED IN THIS ANALYSIS ARE MM

      EVAPORATION DATA FOR RALEIGH
NWS STA. 31-7069      10/1964      OB. TIME=2400.
10/1964      .26      .27      .97      .33      .30      2.74      3.10      2.65      3.02      3.12      2.81      2.66      2.61      .78      .70      .34
      .41      3.63      2.03      .83      2.85      3.28      2.44      2.11      2.50      2.57      1.14      1.59      1.16      2.49      3.21
11/1964      1.63      1.85      2.18      2.05      2.46      2.77      1.17      .41      1.99      1.79      2.83      1.95      1.32      2.77      2.09      1.80
      2.58      .93      2.28      .84      1.83      1.51      1.07      .50      .83      1.87      1.60      .40      2.07      .66
12/1964      1.11      1.72      .37      .34      .10      .77      .87      .86      1.07      .80      .32      .19      .54      1.12      1.27      1.11
      .07      1.19      .64      .00      .22      .31      .00      .69      1.10      .14      .04      .12      .54      .76      1.26
1/1965      .75      .93      2.27      1.36      1.63      .88      1.20      1.72      1.62      .21      .56      .79      .94      1.54      .49      .15
      .43      .94      .95      1.49      1.45      1.78      1.16      .66      1.52      .95      2.56      2.10      2.00      .46      .90
2/1965      1.04      1.24      1.42      1.66      1.61      1.25      .40      1.76      1.35      .28      1.41      1.04      .97      .28      .48      .66
      .46      2.07      2.35      1.70      2.08      2.27      1.62      .08      1.08      2.07      2.20      3.10
3/1965      2.27      .60      .48      .05      1.47      .72      1.63      1.67      2.21      2.28      2.04      .27      1.97      2.41      2.91      3.05
      .52      1.68      2.15      .35      2.20      2.69      .60      .29      .00      .45      2.89      2.65      .68      1.43      2.14
4/1965      .66      3.45      2.94      1.00      2.99      .91      3.03      2.95      4.80      3.72      1.93      4.82      5.55      .68      1.43      2.14
      4.57      5.59      3.45      .38      3.45      3.88      4.16      2.10      .50      1.52      2.68      .40      3.41      5.39
5/1965      5.94      5.95      5.84      5.94      5.50      4.08      1.57      3.56      2.81      5.55      3.82      3.79      5.46      5.85      5.52      5.98
      2.89      5.06      5.89      3.93      3.38      4.80      5.44      4.23      1.39      5.33      3.81      5.59      4.34      3.41      5.24
6/1965      5.64      6.09      2.29      4.36      5.41      5.94      5.15      1.62      1.31      4.76      1.49      1.79      5.05      2.83      .49      .60
      .95      3.67      5.91      5.70      6.32      5.84      6.60      4.27      1.08      .87      2.79      4.59      6.09      5.26
7/1965      6.28      6.01      3.52      3.74      3.41      4.90      2.93      2.92      4.79      3.34      1.11      2.33      3.21      3.91      3.65      4.27
      4.35      4.28      3.13      4.08      3.80      5.05      4.34      3.42      3.45      2.84      3.02      .88      1.46      1.83      2.18
8/1965      1.46      4.78      5.25      3.31      3.42      4.59      4.07      2.61      2.39      4.51      5.16      4.46      5.18      4.30      3.41      3.29
      3.73      4.02      4.34      4.61      2.10      3.69      4.22      1.17      2.15      3.81      5.27      3.69      4.83      4.29      4.77
9/1965      4.63      2.73      1.12      3.15      4.26      4.30      4.22      4.16      4.30      3.94      3.52      2.56      2.46      2.15      3.37      4.00
      2.56      3.38      3.44      4.14      3.59      3.48      3.69      2.29      2.63      2.80      2.41      1.07      3.19      3.43
10/1965      .62      3.19      3.31      3.14      2.61      2.63      1.36      3.23      3.07      2.88      2.53      2.61      2.98      2.44      1.98      2.79
      2.72      2.27      2.11      2.32      1.67      .69      2.48      2.25      2.09      2.35      2.29      2.49      1.96      2.10      3.07
11/1965      2.82      2.03      2.78      2.33      2.41      1.20      2.00      1.84      2.10      .78      .11      .27      .68      1.63      1.85      1.98
      2.34      1.49      1.46      1.64      .93      .50      1.72      1.40      .63      .52      2.06      2.00      1.49      1.21
12/1965      1.09      1.28      1.45      1.88      1.43      1.72      1.36      1.70      1.42      1.52      1.47      1.34      .54      .26      .70      .31
      1.10      .71      .47      .84      .84      .78      .98      .97      .89      1.95      1.03      1.14      1.02      1.39      1.05
1/1966      1.34      1.22      .81      1.12      .38      .04      1.26      1.26      1.03      1.49      1.87      1.07      .96      .44      .43      .57
      1.44      .96      1.39      .97      1.22      .31      1.66      1.14      .74      .37      1.49      1.16      .42      1.39      1.05
2/1966      .94      .42      1.38      1.40      1.45      1.17      1.74      .95      1.12      1.58      .71      .26      1.69      1.61      .47      .21
      2.13      1.11      2.22      1.53      2.01      2.12      1.16      .14      1.56      1.96      1.02      .62
3/1966      3.09      2.48      1.46      1.06      .56      3.20      2.06      1.68      2.12      2.07      2.33      2.97      3.71      2.69      2.56      .69      3.27
      2.72      3.52      1.44      3.83      3.43      3.83      4.07      2.44      3.08      2.92      3.34      3.35      3.11      3.55      3.84
4/1966      4.43      3.68      4.23      1.25      3.64      3.58      3.65      2.21      3.73      3.68      3.34      3.17      .41      .63      2.94      .62
      3.37      4.79      3.70      1.98      2.49      1.04      3.72      5.68      1.99      .54      1.60      .37      .36      2.15
5/1966      3.51      .45      3.89      5.26      5.12      5.58      5.16      4.56      2.03      4.78      4.82      2.30      4.00      .66      4.61      4.05
      5.32      2.48      3.39      4.38      3.83      1.89      4.39      .65      1.18      2.29      .94      3.15      5.34      3.48      2.39
6/1966      4.47      5.35      6.02      6.23      6.17      6.18      4.32      4.95      3.95      1.96      6.04      5.85      6.05      4.37      6.61      4.26
      2.09      1.18      3.71      5.71      6.15      5.67      5.58      5.93      5.55      4.83      3.63      3.21      3.17      3.56
7/1966      2.17      4.34      5.35      5.59      4.52      5.18      5.55      5.28      5.19      4.23      5.95      5.93      4.74      6.35      2.19      2.98
      3.91      5.61      3.74      5.95      6.28      6.40      5.50      6.07      4.85      5.11      5.76      5.09      3.75      .82      6.24
8/1966      5.52      4.52      2.29      .63      3.35      3.79      1.80      2.84      1.12      2.85      3.10      2.54      .79      2.81      3.28      3.86
      3.92      3.35      4.02      4.31      3.02      4.73      3.22      1.90      2.42      .81      3.59      3.73      3.77      3.20      4.53
NWS STA. 31-7069      9/1966      OB. TIME=2400.
9/1966      3.81      4.70      3.89      3.08      2.57      4.40      4.27      4.47      4.15      3.79      3.54      3.44      1.71      1.04      3.00      2.84
      2.89      2.88      .29      1.13      2.02      3.63      3.90      3.78      3.59      1.22      2.07      .39      2.53      4.18

      EVAPORATION DATA FOR CHAPEL HILL
NWS STA. 31-1677      10/1964      OB. TIME= 800.
10/1964      .15      .05      1.85 999.00 999.00      2.34      3.00      2.26      4.50      1.37      2.46      1.91      2.06      .66      .20      .00
      1.07      2.84      3.12      1.37      2.51      2.11      2.39      1.91      2.03      1.75      1.17      1.45      .41      1.91      2.03
11/1964      1.55      1.68      2.29      1.65      1.55      2.59      1.12      .18      1.88      1.14      1.96      2.21      3.63      .43      1.80      1.50
      2.57      1.55      3.71      2.08 999.00 999.00 999.00      .03      3.40      1.52      1.85      .63      2.36 999.00
12/1964      999.00 999.00 999.00      .86 999.00 999.00 999.00 999.00 999.00 999.00      .00      2.18      .05 999.00 999.00 999.00
      .00 999.00 999.00 999.00 999.00 999.00 999.00 999.00      .10      1.65 999.00 2.84      .46      1.42      .46      1.75
1/1965      1.35      1.88 999.00 999.00 999.00 999.00 999.00      1.19      1.91 999.00 999.00 999.00 999.00 999.00 999.00
      999.00 999.00 999.00 999.00 999.00 999.00 999.00 999.00      2.74      1.45      .46 999.00 999.00 999.00 999.00
2/1965      999.00 999.00 999.00 999.00 999.00 999.00 999.00      1.75      2.24      .23      .94      1.45      1.22 999.00 999.00 999.00
      .30      2.34 999.00 999.00 999.00 999.00 999.00 999.00      999.00 999.00 999.00 999.00      2.46
3/1965      2.74      .36      .51 999.00      2.01      .86      1.47      2.18 999.00 999.00 999.00      .69      1.80      2.69      2.90      3.05
      999.00      .97      2.62 999.00 999.00 999.00 999.00      .76      1.70      .51      4.50      1.93      .86      2.46      2.08
4/1965      .53      4.09      2.72      1.24      2.36      .71      3.86      3.51      5.33      3.00      1.27      4.98      5.56      3.30      1.35      3.73
      4.27      5.97      3.10      .46      3.07      2.36      3.48      4.22      .51      1.04      3.81      .58      2.95      4.09
5/1965      4.65      4.62      5.31      5.11      4.27      4.37      1.40      3.38      2.41      5.03      4.67      3.89      5.16      4.55      4.75      5.51

```


Figure 2. Sample output from program MAPE (continued)

```

DAY          MAPE FOR AREA=NUESE@NTHSID      2/1966
 1          .70 .32 1.03 1.05 1.09 .88 1.30 .71 1.13 1.11 .35 .20 1.27 1.43 .35 .16
17         2.31 1.18 2.12 1.14 1.50 1.59 .87 .11 1.78 1.99 .81 .47

DAY          MAPE FOR AREA=NUESE@NTHSID      3/1966
 1         3.54 2.07 .98 .69 4.55 1.91 1.56 1.96 1.91 2.16 2.79 2.36 2.87 2.53 .97 3.32
17         2.20 3.59 1.41 3.76 2.95 3.80 4.24 2.42 3.00 2.81 3.15 3.19 3.03 3.46 3.72

DAY          MAPE FOR AREA=NUESE@NTHSID      4/1966
 1         3.95 4.07 4.22 1.88 3.51 3.49 3.70 1.18 3.81 3.85 2.81 2.99 .71 .80 2.84 .84
17         2.96 4.50 3.60 1.97 2.20 1.02 4.15 5.70 1.61 .58 1.57 .71 .21 2.90

DAY          MAPE FOR AREA=NUESE@NTHSID      5/1966
 1         3.30 .43 3.78 4.90 4.80 5.39 4.62 3.85 3.69 4.21 4.03 2.15 3.51 1.47 3.81 3.65
17         4.79 1.84 3.65 3.95 5.57 1.64 4.68 .61 1.11 2.29 1.34 4.17 3.70 4.27 2.31

DAY          MAPE FOR AREA=NUESE@NTHSID      6/1966
 1         4.05 4.35 5.04 5.63 5.36 5.40 3.82 4.34 4.21 3.38 5.40 5.09 5.42 3.95 5.62 3.95
17         2.62 1.06 3.56 5.02 4.96 5.22 4.68 5.05 5.26 5.40 3.34 4.12 4.00 3.32

DAY          MAPE FOR AREA=NUESE@NTHSID      7/1966
 1         2.69 4.19 4.46 4.41 4.21 5.00 5.26 5.18 5.03 4.03 5.71 4.87 4.59 5.82 2.83 2.50
17         3.79 5.45 2.93 5.95 5.41 5.70 5.07 5.20 5.04 5.08 5.90 4.72 4.43 1.22 5.17

DAY          MAPE FOR AREA=NUESE@NTHSID      8/1966
 1         5.63 4.21 2.50 1.17 3.20 3.97 2.33 2.78 1.51 3.33 3.79 2.97 .77 3.57 3.74 4.25
17         3.50 3.25 3.97 4.54 3.17 3.95 4.68 2.86 2.95 1.31 3.54 4.00 3.97 2.68 4.69

DAY          MAPE FOR AREA=NUESE@NTHSID      9/1966
 1         3.87 4.13 3.84 2.99 3.03 4.56 4.78 4.54 4.29 3.79 3.74 3.82 1.38 1.19 3.58 2.87
17         2.72 2.54 .29 1.12 2.16 3.69 3.95 3.72 3.20 1.40 1.61 .28 2.47 3.66

EVAPORATION DATA SUMMARY FOR PERIOD 10 1964 TO 9 1966
RALEIGH I.D. 31 7069
STATION SUMMARY FOR PERIOD OF ANALYSIS UNITS ARE MM

EVAPORATION YEAR/MONTH      1      2      3      4      5      6      7      8      9      10     11     12     TOTAL
1964          999.99 999.99 999.99 999.99 999.99 999.99 999.99 999.99 999.99 58.92 50.01 19.66 999.99
1965          36.38 37.96 46.76 89.80 141.89 114.75 108.42 118.85 96.97 74.22 46.17 34.61 946.79
1966          30.99 34.71 84.99 78.96 105.86 142.74 150.62 95.62 89.19 999.99 999.99 999.99 999.99

MONTH          1      2      3      4      5      6      7      8      9      10     11     12     ANNUAL AVG
NUMBER OF MONTHS 2      2      2      2      2      2      2      2      2      2      2      2
AVERAGE EVAPORATION 33.68 36.33 65.88 84.38 123.88 128.74 129.52 107.23 93.08 66.57 48.09 27.14 944.52

SEASONAL EVAPORATION SUMMER = 799.28 WINTER = 145.24

EVAPORATION DATA SUMMARY FOR PERIOD 10 1964 TO 9 1966
CHAPEL HILL I.D. 31 1677
STATION SUMMARY FOR PERIOD OF ANALYSIS UNITS ARE MM

EVAPORATION YEAR/MONTH      1      2      3      4      5      6      7      8      9      10     11     12     TOTAL
1964          999.99 999.99 999.99 999.99 999.99 999.99 999.99 999.99 999.99 51.52 50.78 20.40 999.99
1965          16.34 27.55 50.95 87.45 127.38 97.52 103.13 119.13 85.22 73.38 44.47 23.45 855.96
1966          10.76 24.93 81.47 77.84 101.91 125.61 135.71 107.75 89.26 999.99 999.99 999.99 999.99

MONTH          1      2      3      4      5      6      7      8      9      10     11     12     ANNUAL AVG
NUMBER OF MONTHS 2      2      2      2      2      2      2      2      2      2      2      2
AVERAGE EVAPORATION 13.55 26.24 66.21 82.65 114.65 111.56 119.42 113.44 87.24 62.45 47.62 21.93 866.95

SEASONAL EVAPORATION SUMMER = 757.61 WINTER = 109.34

MAPE AREA 1 MEAN AREAL EVAPORATION SUMMARY FOR PERIOD 10 1964 TO 9 1966
NEUSE R. AT NRTHSIDE I.D.NUESE@NTHSID
MAPE SUMMARY FOR PERIOD OF ANALYSIS UNITS ARE MM

EVAPORATION YEAR/MONTH      1      2      3      4      5      6      7      8      9      10     11     12     TOTAL
1964          999.99 999.99 999.99 999.99 999.99 999.99 999.99 999.99 999.99 54.55 50.46 20.10 999.99
1965          24.55 31.82 49.23 88.42 133.33 104.58 105.30 119.01 90.04 73.73 45.17 28.03 893.20
1966          19.06 28.94 82.91 78.30 103.53 132.63 141.82 102.78 89.23 999.99 999.99 999.99 999.99

MONTH          1      2      3      4      5      6      7      8      9      10     11     12     ANNUAL AVG
NUMBER OF MONTHS 2      2      2      2      2      2      2      2      2      2      2      2
AVERAGE EVAPORATION 21.80 30.38 66.07 83.36 118.43 118.61 123.56 110.89 89.63 64.14 47.82 24.06 898.76

SEASONAL EVAPORATION SUMMER = 774.70 WINTER = 124.06

*****
COMPLETION CODE = 0
CPU TIME USED = 0 MINUTES, 1 SECONDS
CLOCK TIME USED = 0 MINUTES, 2 SECONDS
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