III.7-MAP   MEAN AREAL PRECIPITATION PROGRAM (MAP)


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Purpose

The Mean Areal Precipitation (MAP) program provides techniques and
procedures for computing estimates of mean areal precipitation from
station precipitation data.

Chapter III.2 [Hyperlink] describes how to obtain the historical
station data.

In most cases program Precipitation Preliminary Processing (PXPP)
program (see Chapter III.7-PXPP [Hyperlink]) is used to analyze the
station data before running program MAP.

Program MAP includes methods to:

    1.  Estimate missing precipitation amounts.

    2.  Distribute daily or accumulated precipitation into hourly
        amounts.

    3.  Adjust precipitation data for orographic and/or other effects by
        using mean monthly precipitation.

    4.  Create dummy (hypothetical) hourly or daily stations for which
        all precipitation data are estimated.

Program MAP includes the following options for calculating mean areal
precipitation and generating output:

1. Compute grid point, Thiessen or input predetermined station weights.  Grid point and Thiessen weights are computed using basin boundaries input as a series of latitude-longitude pairs.

2. Compute MAP in a 1, 3 or 6 hour data time interval.

3. Make consistency plots of a station's precipitation data without computing or printing MAP.

4. Generate consistency plots or specify predetermined station weights on a seasonal or on an annual basis.  If the Interactive Double Mass Analysis (IDMA) program (see Section III.10-IDMA [Hyperlink]) is to be used to produce correction factors then the consistency plot option must be specified so that the input file needed by IDMA is created.

5. Print a summary of daily precipitation values that could not be distributed.  The daily values are not distributed because all of the available hourly stations contain missing or zero precipitation for the 24 hour period.  This situation occurs when localized events only occur where one or more daily stations are located.  If large numbers of these cases occur then there may not be sufficient hourly stations in the analysis.  If some daily stations have many more cases of values not being distributed than other daily stations then the observation times for those stations should be checked carefully.

6. Print the number of hours for which all hourly stations have missing data.  Precipitation is set to zero for the hourly stations when this occurs.  If this number is very large then additional hourly stations need to be added to the analysis.

Program MAP is currently dimensioned for the following maximum values:
- o    50 basins
- o 3000 basin boundary points per basin
- o  200 precipitation stations
- o    9 changes in observation time for each station
- o   10 precipitation adjustment factors for each station
- o  100 years of data
- o    3 groups of stations for consistency check

Program Input

The program uses free format input for all cards except the Station Time Series Input File Information.

Free Format Input Rules

See Chapter I.3-FREEFMT-UFIELD [Hyperlink] for a description of the general syntax rules.

Syntax rules specific to program MAP are:

1. The '@' indicates a card label. Card labels can be on the same line
   or the line above the fields of the card.  For example:
     @A 10 1965 10 1966
   can be specified as
     @A
         10 1965 10 1966

2. If a card is not needed for a particular run then the label and all
   fields must be omitted.

3. Not all letters are used as card labels.  For example there is no
   card K.

4. Character fields containing commas and embedded blanks must be
   enclosed by apostrophes.  Note that filenames (card A field 9) and
   area descriptions (card I field 2) generally contain blanks.

5. All fields are required.  A null field (double commas) must be used
   to denote single fields for which default values are to be used.
   If N consecutive fields use default values then N+1 commas must be
   used.  The following input implies that defaults are to be used for
   the first two fields on card B:
     @B ,,,

6. Not all fields have valid defaults.  If the documentation does not
   specify a default then the input must be specified.

7. Consecutive commas at the end of a card can be omitted.  For
   example:
     @C GRID,,,
   can be specified as
     @C GRID

Input Data

| Card | Field | Format | Contents |
|------|-------|--------|----------|

**PERIOD OF RECORD AND OUTPUT OPTIONS**

| Card | Field | Format | Contents |
|------|-------|--------|----------|
| A | 1 | | '@A' |
| | 2 | I | First month |
| | 3 | I | First year (four digits) |
| | 4 | I | Last month |
| | 5 | I | Last year (four digits) |
| | 6 | A | Units in which MAP is to be calculated and printed; allowable units are inches ('IN') or |

| Card | Field | Format | Contents |
|------|-------|--------|----------|
| | | | millimeters ('MM'); default is 'IN' |
| | 7 | A | Units in which MAP results will be written into output file ('IN' or 'MM'); default is 'IN' |
| | 8 | | Not used; enter a null field |
| | 9 | A | Option to list MAP results; default is to not list (MAP results must be written to a file in order to be listed): <br> 'LIST' = list MAP time series results |
| | 10 | A20 | Forecast Group directory name; this will become part of the directory name into which MAP results will be written; embedded blanks are not allowed 1/ [Bookmark#1] 2/ [Bookmark#1] <br><br> Leave this field blank if MAP results are not to be written to a file |

**WEIGHTING OPTIONS**

| Card | Field | Format | Contents |
|------|-------|--------|----------|
| B | 1 | | '@B' |
| | 2 | I | Number of areas (enter zero to have only consistency plots made; MAP will not be computed or printed) |
| | 3 | A | Station weighting options; default is 'THIE': <br> 'GRID' = compute grid point station weights for each area <br> 'THIE' = compute Thiessen station weights for each area <br> 'PRE' = read predetermined annual station weights <br> 'SEAS' = read predetermined seasonal station weights for each area (must specify first month of winter in field 8 and the first month of summer in field 9 on this card) |
| | 4 | | Not used; enter a null field |
| | 5 | A | Stop option; default is 'CONT': <br> 'STOP' = terminate program after printing station weights <br> 'CONT' = continue program to calculate MAP |
| | 6 | I | MAP time series data time interval (1, 3 or 6 hours); default is 6 hours |

| Card | Field | Format | Contents |
|------|-------|--------|----------|
|      | 7     | A      | Precipitation adjustment option; default is no precipitation adjustment; adjustments are entered on card O: |

        'ADJ' =   precipitation adjustments required

| | 8 | A | Consistency plot option; default is no consistency plot; consistency plot information is entered on cards R and S; this option must be specified if the IDMA program is to be used to determine correction factors: |

        'PLOT' =   develop precipitation consistency plots
        'SESN' =   develop precipitation consistency plots on a seasonal basis

If 'SESN' is specified as consistency plot option or 'SEAS' is specified as station weighting option then enter beginning winter and summer months:

| Card | Field | Format | Contents |
|------|-------|--------|----------|
|      | 9     | I      | First month of winter; default is 10 |
|      | 10    | I      | First month of summer; default is 5 |
|      | 11    | A      | Observation time correction option; default is no time corrections; corrections are entered on card M: |

        'CTIM' =  time corrections to be read

**INPUT AND OUTPUT OPTIONS**

| Card | Field | Format | Contents |
|------|-------|--------|----------|
| C    | 1     |        | '@C' |
|      | 2     | A      | Mean monthly precipitation option; default is to not use station means: |

        'NORM' =   use mean (normal) monthly precipitation when estimating missing data

| | 3 | A | MAP output option; default is to print MAP summary and table of distribution messages: |

        'COMP' =   print all distribution messages (contact your Focal Point first because this creates large amounts of output)

| | 4 | A | Precipitation comparison option; default is no comparison: |

        'CMPR' =   precipitation comparison desired for evaluation of estimation procedure

| | 5 | R | Minimum station weight; default is 0.01 |

**STATION INFORMATION**

D        1                '@D'

         2       I       Number of hourly stations 3/ [Bookmark#1]

         3       I       Number of daily stations 3/ [Bookmark#2]

Repeat cards F and G for each precipitation station.

The order in which the stations are read determines the run sequence numbers.

F        1                '@F'

         2       A20      Station name

         3       R,I,     Station latitude 4/ [Bookmark#1]
                 I-I

         4       R,I,     Station longitude 4/ [Bookmark#2]
                 I-I

         5       R        Observation time for initial month in local
                          standard time (hours 1 through 24)
                            0 = hourly station

         6       A7       Station identifier or 'DUMMY' if dummy
                          station; default is non-dummy station 14/
                          [Bookmark]

G        1                '@G'

         2-13    R        Mean monthly precipitation values (only used
                          if 'NORM' is specified on card C)

**PRECIPITATION COMPARISON**

Card H is needed only if precipitation comparison are to be done (field 3 on card C).

H        1                '@H'

         2       I        Sequence number of station to be replaced

         3       I        Sequence number of dummy station

**AREA INFORMATION AND PREDETERMINED WEIGHTS**

Omit cards I, J and L if number of areas on card B is zero.

Repeat cards I, J and L for each area in the run.

```
          Card    Field   Format   Contents

    I        1              '@I'

             2       A12    Area identifier

             3       A20    Area description

             4        R     Area size in square kilometers or square miles

             5        A     Area units:
                                'KM2' = square kilometers
                                'MI2' = square miles

             6       A12    Basin name (optional); if specified then this
                            name will become part of the directory name
                            and file name into which MAP results will be
                            written (./basin_name/basin_name.MAPnn); if
                            omitted then the area identifier is used as
                            part of the filename and the additional
                            directory level is omitted (./area_id.MAPnn)
                            1/ [Bookmark#2] 2/ [Bookmark#2]

             7       A12    File name (optional); if specified then the
                            MAP output will be written to that file
                            (./basin_name/file_name.MAPnn); if omitted
                            then the file name will be set to the basin
                            name 1/ [Bookmark#3] 2/ [Bookmark#3]

    Omit card J if using predetermined weights.

    The format of card J is the same as for the PPINIT program DEFINE
    BASIN command. 5/ [Bookmark]

    J        1              '@J'

             2        A     'BASE' or 'BASE(units)'; units can be 'METR'
                            for metric of 'ENGL' for English; default is
                            'ENGL'

             3       A8     Basin identifier

             4       A20    Descriptive information

             5      (R,R)   Latitude/longitude pairs defining basin
                            boundary 4/ [Bookmark#3] 6/ [Bookmark] 7/
                            [Bookmark]
                               or
                            Latitude/longitude pair defining basin
                            centroid 8/ [Bookmark]

    Omit card L if not using predetermined weights.

    L        1              '@L'
```

```
Card    Field   Format  Contents

        2-n     R       Predetermined station weights (order
                        determined from card F)

                        If not using seasonal weights then enter
                        annual station weight for each station

                        If using seasonal weights then enter winter
                        station weights for all stations followed by
                        summer weights for all stations)
```

**OBSERVATION TIME CHANGES**

Card M is needed only if changes are to be made to the observation
times (field 10 on card B).

Changes in observation time for non-recording stations.  One change
per card.  Maximum of 9 changes per station.

Repeat card M for each change.

```
M       1               '@M'

        2       I       Station sequence number
                        Enter '999' for end of card group 9/
                        [Bookmark#1]

        3       I       Month of time change

        4       I       Year (four digits)

        5       R       New observation time in hours (1 to 24)
```

**PRECIPITATION ADJUSTMENTS**

Card O is needed only if adjustments are to be made to the
precipitation data (field 6 on card B). 10/ [Bookmark]

One change per card with a maximum of 10 changes per station.

Repeat card O for each precipitation adjustment factor.

```
O       1               '@O'

        2       A       Season for which precipitation adjustment
                        factor is to be applied; default is winter and
                        summer:
                            'W' = winter
                            'S' = summer
                        Enter '999' for end of card group 9/
                        [Bookmark#2]

        3       I       Sequence number of station
```

| Card | Field | Format | Contents |
|------|-------|--------|----------|
| | 4 | I | Month in which adjustment starts 11/ [Bookmark#1] |
| | 5 | I | Year (four digits) 11/ [Bookmark#2] |
| | 6 | R | Precipitation adjustment factor |

**STATION TIME SERIES INPUT FILE INFORMATION**

| Q | 1 | | '@Q' |
|---|---|---|------|

Repeat station time series input file information card for each station. 12/ [Bookmark]

**CONSISTENCY PLOT INFORMATION**

Cards R and S are needed if precipitation consistency plot is requested (field 7 on card B).

Consistency plots are plotted for each station against all other stations and each station against others in the group to which it is assigned. If a station is not assigned to a group then it is plotted against the first group. A station cannot be assigned to more than one group.

| R | 1 | | '@R' |
|---|---|---|------|
| | 2 | I | Number of groups of stations (maximum is 3); if the number of groups of stations is zero then consistency plots are plotted for each station against all other stations; number of stations assigned to each group (omit if number of groups is zero): |
| | 3 | I | Group 1 |
| | 4 | I | Group 2 |
| | 5 | I | Group 3 |

Omit card S if the number of groups is zero.

Repeat card S for each group.

| S | 1 | | '@S' |
|---|---|---|------|
| | 2-17 | I | Sequence number of each station in the group 13/ [Bookmark] |

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 [Hyperlink]).  The directory defined by this full pathname must be created by the user.

The Forecast Group directory name can be specified as:

    name1
     or
    name1/name2

[Back#1] [Back#2] [Back#3]

2/  The characters 'MAPnn' are appended to the basin name or area identifier to create the full file name where nn is the data time interval.  The maximum length of the full pathname plus the file name is 112 characters.

[Back#1] [Back#2] [Back#3]

3/  This number must include all dummy stations.

[Back#1] [Back#2]

4/  The station location can be input in decimal degrees or degrees and minutes.  For example specifying 50.5 indicates decimal degrees and is equivalent to 50-30 for 5030 which indicates degrees and minutes.  Valid values for minutes are 0 to 59.

If degrees and minutes are input and the optional '-' is omitted then two characters must always be used to specify the minutes. For example 5003 would be a valid input field to specify 50 degrees and 3 minutes.

[Back#1] [Back#2] [Back#3]

5/  See Section VI.3.3B-DEFINE-BASIN [Hyperlink] for a description of the input data.  The first three and last two optional fields are not used by program MAP.  These fields do not need to be included. If they are included then they will be ignored.

[Back]

6/  Pairs must be entered in clockwise order and in decimal degrees. The first value must be preceded by an opening parenthesis.  The last value must be followed by a closing parenthesis.

[Back]

7/  The basin boundary must have at least 3 pairs.

[Back]

8/  If only one latitude/longitude pair is entered it is assumed to be the basin centroid.  The pair must be enclosed in parentheses.

[Back]

9/  The '999' signifies the end of the data.  The field following the '999' must contain a card label.

[Back#1] [Back#2]

10/ Adjustments to each station must be in order by date (earliest first).  Adjustments remain in effect until the date of the next correction.

[Back]

11/ Date must be within the observed period for the station.  If it is not then the correction will be ignored.

[Back#1] [Back#2]

12/ The Q card must be on a separate line preceding the Station Time Series Input File Information cards.

One filename must be included for each station to be used.  The
maximum number of characters in the filename is 40.  See Chapter
I.2-UNIX-CALB [Hyperlink] for a description of the directory
structure.

No Time Series Input File Information card is needed for a DUMMY
station.

The Time Series File Input Information cards for hourly stations
must be entered first followed by the Time Series File Input
Information cards for daily stations.  The Time Series File Input
Information cards are entered in the same station order used for
entering cards F and G.

The period of record for each time series can be different and
need not coincide with the MAP period of record to be calculated.
Time series data are read according to the following rules:

   o If the time series begins before or ends after the desired
     MAP period of record then the extra months are ignored.

   o If the time series begins after or ends before the desired
     MAP period of record then missing data symbols are written
     for the missing months.
                                                           [Back]
13/ Stations with positive sequence numbers make up the group base and
    each is plotted against the average of the other base stations.
    Base must contain at least two stations.  Each station with a
    negative sequence number is dropped from the average of the group
    base stations and is plotted against the group base average.
    Station order does not matter.

    For example group one contains 5 stations.  Sequence numbers are
    3, 5, 6, 9 and 12.  Card S input for group one 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 each plotted against the average of the
    group base stations.
                                                           [Back]
14/ The station identifier is used by program IDMA and is entered as
    the state and station number.  The state can be entered as the 2
    character state abbreviation or the NCDC state number (see Chapter
    I.6 [Hyperlink]).  For example AL0001 and 010001 would be entered
    for station 0001 for Alabama.
                                                           [Back]

Program Execution Information

See Chapter I.2 [Hyperlink] for program execution information.

Sample Input and Output

Figure 1 [Bookmark] is sample program input.

Figure 2 [Bookmark] is sample program output.

Figure 1. Sample input for program MAP

```
$ SAMPLE INPUT FOR PROGRAM MAP

@A  10 1959 9 1961 IN IN ,, LIST map_ts
@B  2 GRID 1 CONT 6 ADJ PLOT
@C  ,,
@D  5 5

@F  'QUEBEC, NC'            35.17   82.89  0.0
@F  'GLOUCESTER GAP,NC'     35.27   82.84  0.0
@F  'PINK BEDS,NC'          35.33   82.78  0.0
@F  'CEDAR MTN,NC'          35.15   83.65  0.0
@F  'HAYWOOD GAP,NC'        35.30   82.91  0.0
@F  'BREVARD, NC'           35.23   82.73  18.
@F  'OWENS GAP,NC'          35.20   82.98  7.
@F  'PISGAH FOREST 1N,NC'   35.27   82.70  8.
@F  'ROSMAN, NC'            35.24   82.83  8.
@F  'SASSAFRASS MTS, SC'    35.06   82.77  8.

@I  MAP-0343990  'FRENCH BROAD, ROSMAN'  67.9  MI2 french_broad
@J  (35.13,82.82  35.13,82.84  35.12,82.84  35.13,82.88  35.10,82.90
     35.17,82.93  35.16,82.97  35.19,82.98  35.20,82.92  35.22,82.92
     35.23,82.93  35.30,82.92  35.31,82.88  35.27,82.87  35.26,82.85)
@I  MAP-0344300  'BLANTYRE LOCAL'        188.  MI2 blantyre
@J  (35.30,82.63  35.26,82.61  35.26,82.56  35.20,82.54  35.16,82.59
     35.14,82.58  35.12,82.67  35.13,82.69  35.10,82.70  35.06,82.77
     35.10,82.81  35.00,82.83  35.12,82.84  35.13,82.84  35.13,82.82
     35.26,82.85  35.26,82.80  35.28,82.74  35.27,82.70  35.33,82.74)

@O  ,,  9  7  1960  .87
@O  999

@Q
Quebec_NC
GloucesterGap_NC
PinkBeds_NC
CedarMtn_NC
HaywoodGap_NC
Brevard_NC
OwensGap_NC
PisgahForest1N_NC
Rosman_NC
SassafrassMtn_SC

@R 1 10

@S 1 2 3 4 5 6 7 8 9 10
```

## Figure 2. Sample output from program MAP

```
NWSRFS CALIBRATION SYSTEM - PROGRAM MAP     (VERSION: 3.2.9SV - 01/22/99)            DATE=Feb 22, 1999 - 14:05:04

>>>>>>>>>>  $ SAMPLE INPUT FOR PROGRAM MAP                                         1  <<<<<<<<<<<<<<<<<<<<
>>>>>>>>>>                                                                          2  <<<<<<<<<<<<<<<<<<<<

   NUMBER      TYPE      PROGRAM      MAP       PRECIP
     OF         OF      TERMINATE   OUTPUT     ADJUST-
    AREAS     WEIGHT     OPTION    INCREMENTS    MENT

     2      GRID POINT  CONTINUE    6 HOUR     ADJUST

    TYPE      MEAN       PRINT     PRECIP     MINIMUM    FIRST     FIRST
     OF      MONTHLY    OPTION   COMPARISON   STATION   WINTER    SUMMER
    PLOT     PRECIP                OPTION     WEIGHT    MONTH     MONTH

   ANNUAL   NOT USED   DEFAULT     NONE        .01       10        5

  *** MAP DATA LISTING REQUESTED.

>>>>>>>>>>                                                                          7  <<<<<<<<<<<<<<<<<<<<
>>>>>>>>>>                                                                         18  <<<<<<<<<<<<<<<<<<<<

PERIOD OF RECORD: 10/1959 THROUGH 09/1961

    STATION          STATION           LATITUDE    LONGITUDE   OBSERVATION
    NUMBER            NAME             COORDINATE   COORDINATE     TIME
    -------   ------------------------  ----------  ----------  -----------

       1      QUEBEC, NC                35.1700     82.8900       .00
       2      GLOUCESTER GAP,NC         35.2700     82.8400       .00
       3      PINK BEDS,NC              35.3300     82.7800       .00
       4      CEDAR MTN,NC              35.1500     83.6500       .00
       5      HAYWOOD GAP,NC            35.3000     82.9100       .00
       6      BREVARD, NC               35.2300     82.7300     18.00
       7      OWENS GAP,NC              35.2000     82.9800      7.00
       8      PISGAH FOREST 1N,NC       35.2700     82.7000      8.00
       9      ROSMAN, NC                35.2400     82.8300      8.00
      10      SASSAFRASS MTS, SC        35.0600     82.7700      8.00

                        *** AREA:  FRENCH BROAD, ROSMAN ***
                        *** ID:  MAP-0343990          ***

*** WARNING - THE COMPUTED  AREA (  62.7 MI2) DIFFERS FROM THE SPECIFIED AREA (  67.9 MI2) BY    8 PERCENT.
 ****************************************************************************************
                                      3 8
                                      5
                                      *29 6
                                      **
                                       @*
                                      7*1**
                                          10

                  4
 ****************************************************************************************

  COMPUTED BASIN CENTROID:  LAT= 35.20    LON=  82.89

  BASIN AREA =    68. MI2

STATION          STATION
NUMBER            NAME              WEIGHT
-------   ------------------------  ------
   1      QUEBEC, NC                  .46
   2      GLOUCESTER GAP,NC           .12
   3      PINK BEDS,NC                .00
   4      CEDAR MTN,NC                .00
   5      HAYWOOD GAP,NC              .12
   6      BREVARD, NC                 .02
   7      OWENS GAP,NC                .12
   8      PISGAH FOREST 1N,NC         .00
   9      ROSMAN, NC                  .11
  10      SASSAFRASS MTS, SC          .04

                        *** AREA:  BLANTYRE LOCAL     ***
                        *** ID:  MAP-0344300          ***
>>>>>>>>>>                                                                         28  <<<<<<<<<<<<<<<<<<<<
 ****************************************************************************************
                                      3 8***
                                     5  ******
                                     29*6@**
                                      ******
                                        ***
                                     7 1  **
```

Figure 2. Sample output from program MAP

```
                                10
                                 *

                        4
****************************************************************************
  COMPUTED BASIN CENTROID: LAT= 35.19    LON=  82.71

  BASIN AREA =    188. MI2

STATION            STATION
NUMBER              NAME                 WEIGHT
-------    -------------------------    ------
   1       QUEBEC, NC                     .06
   2       GLOUCESTER GAP,NC              .01
   3       PINK BEDS,NC                   .03
   4       CEDAR MTN,NC                   .00
   5       HAYWOOD GAP,NC                 .00
   6       BREVARD, NC                    .36
   7       OWENS GAP,NC                   .00
   8       PISGAH FOREST 1N,NC            .24
   9       ROSMAN, NC                     .11
  10       SASSAFRASS MTS, SC             .20

            *** PRECIPITATION ADJUSTMENT FACTORS ***

                                                PRECIPITATION   SEASON OF
    STATION          STATION                     ADJUSTMENT     ADJUSTMENT
    NUMBER            NAME         MONTH   YEAR     FACTOR         FACTOR
    -------   -------------------  -----   ----  -------------   ----------

      9      ROSMAN, NC             7      1960       .87          W  S

                                                              W=WINTER
                                                              S=SUMMER
>>>>>>>>>>                                                  31  <<<<<<<<<<<<<<<<<<<<

                  *** TIME SERIES INPUT DATA ***

FILENAME                     TYPE  DUR  IDENTIFIER    DESCRIPTION              PERIOD OF RECORD

Quebec_NC                    PTPX   1   PTPX-31-7035  QUEBEC, NC               10/1959 THRU 09/1962
GloucesterGap_NC             PTPX   1   PTPX-31-3492  GLOUCESTER GAP, NC       10/1959 THRU 09/1962
PinkBeds_NC                  PTPX   1   PTPX-31-6778  PINK BEDS, NC            10/1959 THRU 09/1962
CedarMtn_NC                  PTPX   1   PTPX-31-1614  CEDAR MTN, NC            10/1959 THRU 09/1962
HaywoodGap_NC                PTPX   1   PTPX-31-3925  HAYWOOD GAP, NC          10/1959 THRU 09/1962
Brevard_NC                   PTPX  24   PTPX-31-1055  BREVARD, NC              10/1959 THRU 09/1962
OwensGap_NC                  PTPX  24   PTPX-31-6449  OWENS GAP, NC            10/1959 THRU 09/1962
PisgahForest1N_NC            PTPX  24   PTPX-31-6805  PISGAH FOREST 1N, NC     10/1959 THRU 09/1962
Rosman_NC                    PTPX  24   PTPX-31-7486  ROSMAN, NC               10/1959 THRU 09/1962
SassafrassMtn_SC             PTPX  24   PTPX-31-7437  SASSAFRASS MTN, SC       10/1959 THRU 09/1962

                  SUMMARY TABLE OF DISTRIBUTION MESSAGES

DAILY VALUES THAT COULD NOT BE DISTRIBUTED:

                                  NUMBER OF DAILY OBS. NOT DISTRIBUTED:      MAX. PRECIPITATION
         STATION  STATION         PRECIP <= 0.5 IN    PRECIP > 0.5 IN        VALUE WHICH COULD NOT
         NUMBER   NAME               (1.25 CM)          (1.25 CM)            BE DISTRIBUTED  (IN )
         -------  ---------------------  ----------------   ----------------   -----------------------
O          6      BREVARD, NC                42                  4                    1.05
O          7      OWENS GAP,NC               17                  0                     .45
O          8      PISGAH FOREST 1N,NC        31                  1                     .98
O          9      ROSMAN, NC                  9                  2                     .69
O         10      SASSAFRASS MTS, SC         27                  2                     .69

HOURLY VALUES THAT COULD NOT BE ESTIMATED:

           NUMBER OF HOURS =     0

(PRECIPITATION IS SET TO ZERO FOR ALL HOURLY STATIONS FOR EACH OF THESE HOURS)

***NOTE***

IF THE NUMBER OF HOURS THAT COULD NOT BE ESTIMATED IS HIGH, SIGNIFICANT BIAS
MAY BE INTRODUCED INTO THE MAP FOR THE BASIN. MORE HOURLY STATIONS SHOULD BE
ADDED TO THE ANALYSIS.

IF ANY DAILY STATIONS HAVE LARGE NUMBERS OF DAILY OBSERVATIONS (RELATIVE TO
THE OTHER STATIONS) THAT WERE NOT DISTRIBUTED,  EITHER THE OBSERVATION TIME
MAY BE WRONG, OR MORE HOURLY STATIONS NEED TO BE ADDED TO THE ANALYSIS

- LISTING OF DATA (UNITS=IN )FOR THE TIME SERIES FRENCH BROAD, ROSMAN

10/1959
        1     .00    .00    .00    .00 /    .00    .00    .00    .00 /    .00    .00    .00    .00 /
        4     .00    .00    .00    .00 /    .00    .00    .00    .00 /    .00    .00    .03    .63 /
        7    1.00    .14    .05    .01 /    .45    .57    .62    .74 /   1.45    .35    .00    .05 /
       10     .03    .17    .36    .22 /    .07    .01    .00    .00 /    .00    .00    .00    .00 /
       13     .00    .00    .01    .48 /   1.14    .20    .14    .00 /    .00    .00    .00    .00 /
       16     .00    .00    .00    .00 /    .00    .00    .35    .04 /    .01    .02    .00    .00 /
       19     .00    .00    .00    .00 /    .00    .00    .00    .00 /    .00    .01    .02    .13 /
       22     .11    .03    .00    .00 /    .08    .25    .73    .02 /    .06    .05    .01    .02 /
       25     .04    .06    .00    .00 /    .00    .00    .00    .00 /    .00    .00    .00    .00 /
```

Figure 2. Sample output from program MAP

```
        28      .00     .00     .00     .00 /     .00     .21     .44     .19 /     .22     .25     .17     .22 /
        31      .04     .06     .00     .00 /

11/1959
         1      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
         4      .00     .00     .00     .00 /     .04     .02     .08     .31 /     .22     .00     .00     .00 /
         7      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        10      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        13      .00     .00     .00     .00 /     .09     .05     .00     .00 /     .05     .05     .00     .00 /
        16      .00     .00     .05     .23 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        19      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .01     .02     .00     .00 /
        22      .00     .00     .00     .00 /     .00     .00     .02     .03 /     .96     .17     .01     .00 /
        25      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .69 /
        28      .01     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .01 /

12/1959
         1      .00     .00     .00     .00 /     .00     .00     .14     .04 /     .02     .01     .00     .00 /
         4      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .11     .27     .03     .02 /
         7      .01     .01     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        10      .00     .00     .00     .00 /     .00     .00     .01     .23 /     .73     .76     .06     .06 /
        13      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        16      .00     .00     .00     .00 /     .00     .03     .04     .15 /     .22     .64     .30     .10 /
        19      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        22      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .05 /
        25      .12     .03     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .02     .11 /
        28      .52     .83     .13     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        31      .00     .00     .00     .00 /

[Time series data listing for months 1/1960 through 6/1961 deleted.]

 7/1961
         1      .00     .00     .03     .00 /     .00     .00     .12     .00 /     .00     .00     .00     .00 /
         4      .01     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
         7      .00     .22     .31     .02 /     .00     .00     .00     .00 /     .00     .02     .00     .00 /
        10      .00     .00     .00     .00 /     .00     .00     .00     .44 /     .25     .07     .25     .08 /
        13      .01     .02     .33     .00 /     .00     .23     .00     .01 /     .00     .01     .29     .00 /
        16      .00     .01     .28     .11 /     .01     .09     .00     .00 /     .00     .01     .21     .01 /
        19      .00     .04     .05     .03 /     .00     .00     .03     .42 /     .01     .03     .19     .00 /
        22      .00     .17     .18     .03 /     .00     .19     .31     .00 /     .00     .00     .00     .03 /
        25      .00     .00     .00     .00 /     .00     .00    1.75     .02 /     .00     .00     .09     .00 /
        28      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .08     .08     .00 /
        31      .00     .10     .00     .00 /

 8/1961
         1      .00     .01     .00     .00 /     .00     .01     .15     .15 /     .00     .03     .23     .00 /
         4      .00     .03     .10     .93 /     .01     .02     .00     .00 /     .00     .00     .04     .00 /
         7      .00     .02    1.09     .36 /     .00     .05     .10     .00 /     .00     .01     .52    1.91 /
        10      .47     .00     .01     .00 /     .00     .01     .00     .00 /     .00     .02     .00     .00 /
        13      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        16      .00     .00     .00     .00 /     .00     .03     .00     .00 /     .00     .00     .01     .33 /
        19      .01     .00     .00     .00 /     .00     .00     .01     .00 /     .00     .07    1.05     .34 /
        22      .00     .03     .20     .06 /     .00     .04     .00     .48 /    2.60     .66    1.96     .07 /
        25      .43     .93     .20     .00 /     .00     .08     .21     .10 /     .03     .06     .01     .86 /
        28      .16     .07     .01     .00 /     .00     .00     .00     .06 /     .18     .00     .05     .19     .06 /
        31      .00     .02     .00     .04 /

 9/1961
         1      .01     .02     .37     .00 /     .00     .00     .00     .00 /     .00     .01     .02     .00 /
         4      .00     .37     .00     .00 /     .00     .00     .04     .00 /     .00     .00     .00     .00 /
         7      .17     .05     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        10      .00     .00     .00     .01 /     .35     .08     .10     .00 /     .00     .00     .00     .00 /
        13      .00     .01     .00     .00 /     .00     .05     .02     .02 /     .00     .00     .00     .00 /
        16      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .15     .02 /
        19      .11     .20     .09     .03 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        22      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        25      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        28      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /

 - LISTING OF DATA (UNITS=IN  )FOR THE TIME SERIES BLANTYRE LOCAL

10/1959
         1      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
         4      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .01     .53 /
         7      .44     .08     .03     .01 /     .25     .39     .48     .62 /    1.06     .56     .01     .13 /
        10      .11     .21     .50     .17 /     .07     .01     .00     .00 /     .00     .00     .00     .00 /
        13      .00     .00     .02     .52 /    1.25     .28     .15     .00 /     .00     .01     .00     .02 /
        16      .00     .00     .00     .00 /     .01     .00     .34     .03 /     .01     .01     .00     .00 /
        19      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .01     .03     .11 /
        22      .13     .02     .00     .00 /     .07     .24     .64     .05 /     .05     .04     .00     .00 /
        25      .00     .01     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        28      .00     .00     .00     .00 /     .00     .23     .24     .10 /     .14     .27     .17     .26 /
        31      .05     .07     .00     .00 /

11/1959
         1      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
         4      .00     .00     .00     .00 /     .03     .03     .04     .10 /     .07     .00     .00     .00 /
         7      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        10      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
        13      .00     .00     .00     .00 /     .02     .03     .00     .00 /     .04     .07     .00     .00 /
        16      .00     .00     .02     .14 /     .00     .00     .00     .00 /     .00     .00     .01     .00 /
        19      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .01     .00     .00 /
        22      .00     .00     .00     .00 /     .00     .01     .05     .04 /    1.21     .15     .01     .00 /
        25      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .46 /
        28      .00     .00     .00     .00 /     .00     .00     .00     .00 /     .00     .00     .00     .00 /
```

## Figure 2. Sample output from program MAP

```
12/1959
          1      .00      .00      .00      .00 /    .00      .00      .14      .07 /    .02      .01      .00      .00 /
          4      .00      .00      .01      .00 /    .00      .00      .00      .00 /    .03      .18      .01      .05 /
          7      .03      .02      .00      .00 /    .00      .00      .00      .00 /    .00      .00      .00      .00 /
         10      .00      .00      .00      .00 /    .00      .00      .01      .18 /    .44      .61      .01      .04 /
         13      .00      .00      .00      .00 /    .00      .00      .00      .00 /    .00      .00      .00      .00 /
         16      .00      .00      .00      .00 /    .00      .01      .02      .16 /    .20      .65      .35      .22 /
         19      .01      .00      .00      .00 /    .00      .00      .00      .00 /    .00      .00      .00      .00 /
         22      .00      .00      .00      .00 /    .00      .00      .00      .00 /    .00      .00      .00      .05 /
         25      .13      .05      .00      .00 /    .00      .00      .03      .00 /    .00      .00      .01      .07 /
         28      .50      .69      .19      .00 /    .00      .00      .00      .00 /    .00      .00      .00      .00 /
         31      .00      .00      .00      .00 /

[Time series data listing for months 1/1960 through 6/1961 deleted.]

 7/1961
          1      .00      .02      .29      .00 /    .00      .00      .23      .00 /    .00      .09      .00      .00 /
          4      .00      .00      .00      .00 /    .00      .00      .00      .00 /    .00      .01      .00      .00 /
          7      .00      .31      .19      .01 /    .01      .01      .00      .00 /    .00      .08      .00      .00 /
         10      .00      .01      .00      .00 /    .00      .00      .00      .45 /    .20      .09      .26      .08 /
         13      .01      .01      .40      .00 /    .00      .29      .00      .00 /    .00      .01      .28      .00 /
         16      .00      .00      .23      .17 /    .03      .23      .00      .00 /    .00      .03      .31      .00 /
         19      .00      .10      .02      .27 /    .00      .00      .29      .80 /    .00      .03      .42      .01 /
         22      .00      .10      .13      .02 /    .00      .03      .41      .00 /    .00      .00      .00      .04 /
         25      .00      .00      .00      .00 /    .00      .02      .40      .04 /    .01      .01      .12      .00 /
         28      .00      .00      .00      .00 /    .00      .00      .00      .00 /    .00      .01      .01      .00 /
         31      .00      .35      .00      .00 /

 8/1961
          1      .00      .07      .12      .00 /    .00      .03      .03      .08 /    .00      .00      .66      .00 /
          4      .00      .16      .14      .85 /    .00      .07      .00      .00 /    .00      .03      .05      .00 /
          7      .00      .02     1.05      .51 /    .00      .05      .13      .00 /    .00      .01      .57     1.15 /
         10      .48      .00      .00      .00 /    .00      .02      .01      .00 /    .00      .03      .00      .00 /
         13      .00      .00      .00      .00 /    .00      .00      .01      .00 /    .00      .00      .00      .00 /
         16      .00      .00      .00      .00 /    .00      .00      .00      .00 /    .00      .00      .18      .74 /
         19      .02      .00      .00      .00 /    .00      .02      .10      .00 /    .00      .05     1.02      .29 /
         22      .00      .01      .00      .03 /    .00      .01      .00      .33 /   2.34      .33     2.18      .09 /
         25      .44     1.05      .23      .00 /    .00      .18      .34      .07 /    .05      .04      .02      .44 /
         28      .10      .11      .01      .00 /    .00      .00      .00      .09 /    .00      .12     1.18      .05 /
         31      .01      .01      .00      .06 /

 9/1961
          1      .00      .04      .29      .00 /    .00      .01      .00      .00 /    .00      .02      .01      .00 /
          4      .00      .05      .00      .00 /    .00      .00      .18      .00 /    .00      .00      .00      .00 /
          7      .11      .00      .00      .00 /    .00      .00      .00      .00 /    .00      .00      .00      .00 /
         10      .00      .00      .00      .03 /    .50      .10      .06      .00 /    .00      .00      .05      .00 /
         13      .00      .06      .00      .00 /    .00      .05      .02      .01 /    .00      .00      .00      .00 /
         16      .00      .00      .00      .00 /    .00      .00      .00      .00 /    .00      .00      .09      .02 /
         19      .10      .22      .10      .05 /    .00      .00      .00      .00 /    .00      .00      .00      .00 /
         22      .00      .00      .00      .00 /    .00      .00      .00      .00 /    .00      .00      .00      .00 /
         25      .00      .00      .00      .00 /    .00      .00      .00      .00 /    .00      .00      .00      .00 /
         28      .00      .00      .00      .00 /    .00      .00      .00      .00 /    .00      .00      .00      .00 /
>>>>>>>>>>                                                                      33  <<<<<<<<<<<<<<<<<<<
>>>>>>>>>>                                                                      35  <<<<<<<<<<<<<<<<<<<
```

PRECIPITATION CONSISTENCY CHECK.

STATIONS WITH POSITIVE NUMBERS CONSTITUTE THE GROUP BASE AND ARE PLOTTED AGAINST THE OTHER STATIONS IN THE GROUP BASE

STATIONS WITH NEGATIVE RUN NUMBERS ARE PLOTTED AGAINST THE GROUP BASE

```
          STATIONS IN GROUP 1

STA. RUN NO.        STATION NAME
        1           QUEBEC, NC
        2           GLOUCESTER GAP,NC
        3           PINK BEDS,NC
        4           CEDAR MTN,NC
        5           HAYWOOD GAP,NC
        6           BREVARD, NC
        7           OWENS GAP,NC
        8           PISGAH FOREST 1N,NC
        9           ROSMAN, NC
       10           SASSAFRASS MTS, SC
```

MONTHLY LISTING OF ACCUMULATED PRECIPITATION AND BASE PRECIPITATION.

| MO/YEAR | QUEBEC, NC ACC. PX | BASE PX | GLOUCESTER GAP,NC ACC. PX | BASE PX | PINK BEDS,NC ACC. PX | BASE PX | CEDAR MTN,NC ACC. PX | BASE PX | HAYWOOD GAP,NC ACC. PX | BASE PX |
|---|---|---|---|---|---|---|---|---|---|---|
| 10/1959 | 11.7 | 13.4 | 14.7 | 13.0 | 14.2 | 13.1 | 16.0 | 12.9 | 14.7 | 13.0 |
| 11/1959 | 14.3 | 16.5 | 18.3 | 16.1 | 17.4 | 16.2 | 18.9 | 16.0 | 19.4 | 16.0 |
| 12/1959 | 19.6 | 22.3 | 24.0 | 21.8 | 22.4 | 22.0 | 25.7 | 21.6 | 26.3 | 21.5 |
| 1/1960 | 25.5 | 29.3 | 32.1 | 28.6 | 30.0 | 28.9 | 32.0 | 28.6 | 36.2 | 28.2 |
| 2/1960 | 34.6 | 38.6 | 41.9 | 37.8 | 38.2 | 38.2 | 43.0 | 37.7 | 44.2 | 37.6 |
| 3/1960 | 42.0 | 46.8 | 49.4 | 46.0 | 46.1 | 46.4 | 52.4 | 45.7 | 51.9 | 45.7 |
| 4/1960 | 46.9 | 50.9 | 52.8 | 50.2 | 50.2 | 50.5 | 57.5 | 49.7 | 55.8 | 49.9 |
| 5/1960 | 50.5 | 54.7 | 56.6 | 54.0 | 53.7 | 54.3 | 61.3 | 53.5 | 60.0 | 53.6 |
| 6/1960 | 56.6 | 61.4 | 68.0 | 60.2 | 60.8 | 61.0 | 65.7 | 60.4 | 66.6 | 60.3 |
| 7/1960 | 61.2 | 65.7 | 70.5 | 64.7 | 64.3 | 65.4 | 68.8 | 64.9 | 71.7 | 64.5 |
| 8/1960 | 68.7 | 75.8 | 81.8 | 74.3 | 73.2 | 75.3 | 80.8 | 74.4 | 82.1 | 74.3 |
| 9/1960 | 75.6 | 81.2 | 87.3 | 79.9 | 77.8 | 81.0 | 85.3 | 80.1 | 87.4 | 79.9 |
| 10/1960 | 81.1 | 87.9 | 93.7 | 86.5 | 83.9 | 87.5 | 91.1 | 86.7 | 95.0 | 86.3 |
| 11/1960 | 81.8 | 89.1 | 95.1 | 87.7 | 84.9 | 88.8 | 92.2 | 88.0 | 97.2 | 87.4 |

## Figure 2. Sample output from program MAP

```
12/1960        85.2      92.6      98.7      91.0      88.2      92.2      96.1      91.3     101.1      90.8
 1/1961        87.3      95.8     102.4      94.2      90.8      95.5     100.3      94.4     105.2      93.9
 2/1961        98.2     106.5     113.2     104.9     101.2     106.2     112.7     104.9     119.2     104.2
 3/1961       104.4     113.8     121.2     111.9     108.4     113.3     119.2     112.1     128.7     111.0
 4/1961       110.1     119.4     126.7     117.6     113.2     119.1     125.8     117.7     135.1     116.6
 5/1961       113.7     124.7     131.9     122.7     118.1     124.3     132.0     122.7     141.9     121.6
 6/1961       122.5     134.7     142.1     132.6     125.5     134.4     144.5     132.3     151.2     131.6
 7/1961       130.0     141.9     147.8     139.9     131.7     141.7     151.6     139.5     158.2     138.8
 8/1961       149.2     159.5     166.0     157.6     148.6     159.6     172.0     157.0     172.6     156.9
 9/1961       151.7     161.6     167.7     159.8     150.8     161.7     174.2     159.1     174.8     159.1
```

DEVIATION OF ACCUMULATED PRECIPITATION FROM THE GROUP BASE-----GROUP=1

```
        STA. RUN NO.       STA. PLOT NO.        STATION NAME
             1                  1               QUEBEC, NC
             2                  2               GLOUCESTER GAP,NC
             3                  3               PINK BEDS,NC
             4                  4               CEDAR MTN,NC
             5                  5               HAYWOOD GAP,NC

        ASTERISKS INDICATE ZERO DEVIATION              UNITS ARE IN

BASE PX    -39.6     -33.6     -27.6     -21.6     -15.6      -9.6      -3.6       2.4       8.4      14.4      20.4
     .0    .         .         .         .         .         .         .         *  .       .         .         .
    1.7    .         .         .         .         .         .         .         *  .       .         .         .
    3.4    .         .         .         .         .         .         .         *  .       .         .         .
    5.1    .         .         .         .         .         .         .         *  .       .         .         .
    6.8    .         .         .         .         .         .         .         *  .       .         .         .
    8.5    .         .         .         .         .         .         .         *  .       .         .         .
   10.2    .         .         .         .         .         .         .         *  .       .         .         .
   11.9    .         .         .         .         .         .         .         *  .       .         .         .
   13.6    .         .         .         .         .         .         . 1  * 35.4         .         .         .
   15.3    .         .         .         .         .         .         .    *   245         .         .         .
   17.0    .         .         .         .         .         .         . 1   * 3 .         .         .         .
   18.7    .         .         .         .         .         .         .         *  .       .         .         .
   20.4    .         .         .         .         .         .         .         *  .       .         .         .
   22.1    .         .         .         .         .         .         . 1   *3  2  45      .         .         .
   23.8    .         .         .         .         .         .         .         *  .       .         .         .
   25.5    .         .         .         .         .         .         .         *  .       .         .         .
   27.2    .         .         .         .         .         .         .         *  .       .         .         .
   28.9    .         .         .         .         .         .         .  1     * 3 . 4       5.        .         .
   30.6    .         .         .         .         .         .         .         *  .       .         .         .
   32.3    .         .         .         .         .         .         .         *  .       .         .         .
   34.0    .         .         .         .         .         .         .         *  .       .         .         .
   35.7    .         .         .         .         .         .         .         *  .       .         .         .
   37.4    .         .         .         .         .         .         .         3  .  2 4 5 .         .         .
   39.1    .         .         .         .         .         .         . 1.      *  .       .         .         .
   40.8    .         .         .         .         .         .         .         *  .       .         .         .
   42.5    .         .         .         .         .         .         .         *  .       .         .         .
   44.2    .         .         .         .         .         .         .         *  .       .         .         .
   45.9    .         .         .         .         .         .         .         3  . 2   54 .         .         .
   47.6    .         .         .         .         .         .         1 .       *  .       .         .         .
   49.3    .         .         .         .         .         .         .         *  .   5 4.        .         .
   51.0    .         .         .         .         .         .         1.    3*   2       .         .         .
   52.7    .         .         .         .         .         .         .         *  .       4.        .         .
   54.4    .         .         .         .         .         .         1.    3*   2      5  .       .         .
   56.1    .         .         .         .         .         .         .         *  .       .         .         .
   57.8    .         .         .         .         .         .         .         *  .       .         .         .
   59.5    .         .         .         .         .         .         .         *  .   5 2.        .         .
   61.2    .         .         .         .         .         .         1.      3  .   4     .       .         .
   62.9    .         .         .         .         .         .         .         *  .       .         .         .
   64.6    .         .         .         .         .         .         .  3 *   .  4 2 5 .         .         .
   66.3    .         .         .         .         .         .         1 .       *  .       .         .         .
   68.0    .         .         .         .         .         .         .         *  .       .         .         .
   69.7    .         .         .         .         .         .         .         *  .       .         .         .
   71.4    .         .         .         .         .         .         .         *  .       .         .         .
   73.1    .         .         .         .         .         .         .  *   *  .       .         .         .
   74.8    .         .         .         .         .         .         .  3  *   .     425.        .         .
   76.5    .         .         .         .         .         1         .         *  .       .         .         .
   78.2    .         .         .         .         .         .         .         *  .       .         .         .
   79.9    .         .         .         .         .         .         .         *  .   4  25.        .         .
   81.6    .         .         .         .         .         .         1 .3      *  .       .         .         .
   83.3    .         .         .         .         .         .         .  .      *  .       .         .         .
   85.0    .         .         .         .         .         .         .         *  .       .         .         .
   86.7    .         .         .         .         .         .         .  3      *  . 4    2 5 5      .         .
   88.4    .         .         .         .         .         .  11   3. .       *  . 4   2.        .         .
   90.1    .         .         .         .         .         .         .         *  .       . 5       .         .
   91.8    .         .         .         .         .         .  1     3. .       *  . 4   2.        .         .
   93.5    .         .         .         .         .         .         .         *  .       2   5     .         .
   95.2    .         .         .         .         .         . 1     3. .       *  .   4     .       .         .
   96.9    .         .         .         .         .         .         .         *  .       .         .         .
   98.6    .         .         .         .         .         .         .         *  .       .         .         .
  100.3    .         .         .         .         .         .         .         *  .       .         .         .
  102.0    .         .         .         .         .         .         .         *  .       .         .         .
  103.7    .         .         .         .         .         .         .         *  .       .        .5        .
  105.4    .         .         .         .         .         .         3. .       *  .       42        .         .
  107.1    .         .         .         .         .         . 1       .         *  .       .         .         .
  108.8    .         .         .         .         .         .         .         *  .       .         .         .
  110.5    .         .         .         .         .         .         .         *  .       .         .   5     .
  112.2    .         .         .         .         .         .         . 1     3. *  .   4 .2        .         .
  113.9    .         .         .         .         .         . 1       3. .       *  .       .         .         .
  115.6    .         .         .         .         .         .         .         *  .       .         .         .
  117.3    .         .         .         .         .         .         1    .    *  .       42        .   5 .
  119.0    .         .         .         .         .         . 1       3 .       *  .       .         .         .
```

## Figure 2. Sample output from program MAP

```
120.7   .         .         .         .         .         .         .    *  .         .         .         .
122.4   .         .         .         .         .         .         .    *  .        .4         .         5
124.1   .         .         .         .         .    1 .    3    .    *  .         .         .         .
125.8   .         .         .         .         .         .         .    *  .         .         .         .
127.5   .         .         .         .         .         .         .    *  .         .         .         .
129.2   .         .         .         .         .         .         .    *  .         .         .         .
130.9   .         .         .         .         .         .         .    *  .         .         .        5.
132.6   .         .         .         .         .         .    .    *  .         . 2   4   .         .
134.3   .         .         .         .         .    1  .3    .    *  .         .         .         .
136.0   .         .         .         .         .         .         .    *  .         .         .         .
137.7   .         .         .         .         .         .         .    *  .         .         .         .
139.4   .         .         .         .         .         .         .    *  .         . 2.    4   .    5 .
141.1   .         .         .         .         .    1  3.    .    *  .         .         .         .
142.8   .         .         .         .         .         .         .    *  .         .         .         .
144.5   .         .         .         .         .         .         .    *  .         .         .         .
146.2   .         .         .         .         .         .         .    *  .         .         .         .
147.9   .         .         .         .         .         .         .    *  .         .         .         .
149.6   .         .         .         .         .         .         .    *  .         .         .         .
151.3   .         .         .         .         .         .         .    *  .         .         .         .
153.0   .         .         .         .         .         .         .    *  .         .         .         .
154.7   .         .         .         .         .         .         .    *  .         .         .         .
156.4   .         .         .         .         .         .         .    *  .         .        .45        .
158.1   .         .         .         .         .         .         .    *  .         . 2        .         .
159.8   .         .         .         .         .   31.     .    *  .         . 2.       .45        .
161.5   .         .         .         .         .    3 1    .    *  .         .         .         .
163.2   .         .         .         .         .         .         .    *  .         .         .         .
164.9   .         .         .         .         .         .         .    *  .         .         .         .
166.6   .         .         .         .         .         .         .    *  .         .         .         .
168.3   .         .         .         .         .         .         .    *  .         .         .         .
170.0   .         .         .         .         .         .         .    *  .         .         .         .
```

MONTHLY LISTING OF ACCUMULATED PRECIPITATION AND BASE PRECIPITATION.

|  | BREVARD, NC | | OWENS GAP,NC | | PISGAH FOREST 1N,NC | | ROSMAN, NC | | SASSAFRASS MTS, SC | |
|---|---|---|---|---|---|---|---|---|---|---|
| MO/YEAR | ACC. PX | BASE PX | ACC. PX | BASE PX | ACC. PX | BASE PX | ACC. PX | BASE PX | ACC. PX | BASE PX |
| 10/1959 | 9.8 | 13.6 | 14.8 | 13.0 | 9.2 | 13.7 | 10.7 | 13.5 | 16.2 | 12.9 |
| 11/1959 | 12.0 | 16.8 | 17.6 | 16.2 | 11.4 | 16.8 | 14.5 | 16.5 | 19.2 | 16.0 |
| 12/1959 | 16.8 | 22.6 | 22.5 | 21.9 | 15.9 | 22.7 | 22.7 | 21.9 | 24.2 | 21.8 |
| 1/1960 | 22.8 | 29.6 | 28.6 | 29.0 | 22.3 | 29.7 | 29.8 | 28.9 | 30.3 | 28.8 |
| 2/1960 | 31.3 | 39.0 | 37.5 | 38.3 | 31.5 | 39.0 | 39.9 | 38.0 | 40.1 | 38.0 |
| 3/1960 | 38.3 | 47.2 | 47.7 | 46.2 | 39.5 | 47.1 | 47.9 | 46.2 | 48.1 | 46.1 |
| 4/1960 | 42.2 | 51.4 | 50.6 | 50.5 | 43.2 | 51.3 | 52.5 | 50.2 | 53.0 | 50.2 |
| 5/1960 | 45.7 | 55.2 | 54.0 | 54.3 | 46.5 | 55.1 | 57.3 | 53.9 | 57.2 | 53.9 |
| 6/1960 | 53.3 | 61.8 | 59.1 | 61.2 | 53.5 | 61.8 | 62.1 | 60.8 | 63.9 | 60.6 |
| 7/1960 | 57.6 | 66.1 | 63.0 | 65.5 | 58.1 | 66.0 | 65.9 | 65.2 | 71.4 | 64.6 |
| 8/1960 | 65.7 | 76.1 | 71.2 | 75.5 | 64.3 | 76.3 | 78.4 | 74.7 | 84.5 | 74.0 |
| 9/1960 | 70.4 | 81.8 | 78.4 | 80.9 | 67.9 | 82.1 | 85.1 | 80.1 | 91.2 | 79.5 |
| 10/1960 | 77.9 | 88.2 | 85.3 | 87.4 | 75.6 | 88.5 | 90.5 | 86.8 | 97.8 | 86.0 |
| 11/1960 | 78.7 | 89.5 | 86.5 | 88.6 | 76.3 | 89.8 | 91.7 | 88.0 | 99.6 | 87.2 |
| 12/1960 | 82.0 | 92.9 | 89.1 | 92.1 | 79.5 | 93.2 | 95.1 | 91.4 | 103.1 | 90.6 |
| 1/1961 | 84.6 | 96.1 | 92.1 | 95.3 | 82.3 | 96.4 | 97.9 | 94.7 | 107.0 | 93.7 |
| 2/1961 | 93.9 | 107.0 | 102.9 | 106.0 | 91.2 | 107.3 | 107.9 | 105.5 | 116.7 | 104.5 |
| 3/1961 | 100.0 | 114.2 | 110.8 | 113.0 | 97.0 | 114.6 | 113.9 | 112.7 | 124.6 | 111.5 |
| 4/1961 | 105.6 | 119.9 | 115.9 | 118.8 | 102.0 | 120.3 | 119.7 | 118.3 | 130.7 | 117.1 |
| 5/1961 | 110.0 | 125.2 | 119.4 | 124.1 | 107.0 | 125.5 | 127.0 | 123.3 | 135.5 | 122.3 |
| 6/1961 | 119.5 | 135.1 | 129.0 | 134.0 | 115.0 | 135.6 | 138.8 | 132.9 | 147.1 | 132.0 |
| 7/1961 | 128.1 | 142.1 | 133.1 | 141.6 | 119.8 | 143.0 | 148.9 | 139.8 | 157.9 | 138.8 |
| 8/1961 | 149.0 | 159.5 | 144.3 | 160.0 | 138.5 | 160.7 | 173.8 | 156.8 | 170.7 | 157.1 |
| 9/1961 | 151.3 | 161.7 | 146.5 | 162.2 | 140.2 | 162.9 | 175.9 | 158.9 | 173.4 | 159.2 |

DEVIATION OF ACCUMULATED PRECIPITATION FROM THE GROUP BASE-----GROUP=1

| STA. RUN NO. | STA. PLOT NO. | STATION NAME |
|---|---|---|
| 6 | 1 | BREVARD, NC |
| 7 | 2 | OWENS GAP,NC |
| 8 | 3 | PISGAH FOREST 1N,NC |
| 9 | 4 | ROSMAN, NC |
| 10 | 5 | SASSAFRASS MTS, SC |

ASTERISKS INDICATE ZERO DEVIATION          UNITS ARE IN

```
BASE PX   -40.8    -34.8    -28.8    -22.8    -16.8    -10.8     -4.8      1.2      7.2     13.2     19.2
   .0    .         .         .         .         .         .         .    *  .         .         .         .
  1.7    .         .         .         .         .         .         .    *  .         .         .         .
  3.4    .         .         .         .         .         .         .    *  .         .         .         .
  5.1    .         .         .         .         .         .         .    *  .         .         .         .
  6.8    .         .         .         .         .         .         .    *  .         .         .         .
  8.5    .         .         .         .         .         .         .    *  .         .         .         .
 10.2    .         .         .         .         .         .         .    *  .         .         .         .
 11.9    .         .         .         .         .         .         .    *  .         .         .         .
 13.6    .         .         .         .         .         .    .314     * .2  5     .         .         .
 15.3    .         .         .         .         .         .         .    *  . 5        .         .         .
 17.0    .         .         .         .         .         .   31    4  * 2        .         .         .
 18.7    .         .         .         .         .         .         .    *  .         .         .         .
 20.4    .         .         .         .         .         .         .    *  .         .         .         .
 22.1    .         .         .         .         .         .   31 .    *4. 5     .         .         .
 23.8    .         .         .         .         .         .         .    *  .         .         .         .
 25.5    .         .         .         .         .         .         .    *  .         .         .         .
 27.2    .         .         .         .         .         .         .    *  .         .         .         .
 28.9    .         .         .         .         .         .   31 .    2* 5     .         .         .
 30.6    .         .         .         .         .         .         .    *  .         .         .         .
 32.3    .         .         .         .         .         .         .    *  .         .         .         .
 34.0    .         .         .         .         .         .         .    *  .         .         .         .
```

Figure 2. Sample output from program MAP

```
 35.7   .         .         .         .         .         .         .     * .         .         .         .
 37.4   .         .         .         .         .         .         .     * .5        .         .         .
 39.1   .         .         .         .         .         .       3 .     2* .         .         .         .
 40.8   .         .         .         .         .         .         .     * .         .         .         .
 42.5   .         .         .         .         .         .         .     * .         .         .         .
 44.2   .         .         .         .         .         .         .     * .         .         .         .
 45.9   .         .         .         .         .         .         .     * .5        .         .         .
 47.6   .         .         .         .         .         .     1 3 .     * .         .         .         .
 49.3   .         .         .         .         .         .         .     * .         .         .         .
 51.0   .         .         .         .         .         .      13 .     2 . 45      .         .         .
 52.7   .         .         .         .         .         .         .     * .         .         .         .
 54.4   .         .         .         .         .         .     1 3 .     2* . 54     .         .         .
 56.1   .         .         .         .         .         .         .     * .         .         .         .
 57.8   .         .         .         .         .         .         .     * .         .         .         .
 59.5   .         .         .         .         .         .         .     * .         .         .         .
 61.2   .         .         .         .         .         .       3 .     2 * 4   5   .         .         .
 62.9   .         .         .         .         .         .         .     *         .         .         .
 64.6   .         .         .         .         .         .         .    *4.         5.        .         .
 66.3   .         .         .         .         .         .      13 .     2 * .         .         .         .
 68.0   .         .         .         .         .         .         .     * .         .         .         .
 69.7   .         .         .         .         .         .         .     * .         .         .         .
 71.4   .         .         .         .         .         .         .     * .         .         .         .
 73.1   .         .         .         .         .         .         .     * .         .         .         .
 74.8   .         .         .         .         .       . .        .2    * . 4     .     5   .         .
 76.5   .         .         .         .         .       3 .1        .     * .         .         .         .
 78.2   .         .         .         .         .         .         .     * .         .         .         .
 79.9   .         .         .         .         .         .         .     * . 4     .     5   .         .
 81.6   .         .         .         .         .       3   1.      .     2 * .         .         .         .
 83.3   .         .         .         .         .         .         .     * .         .         .         .
 85.0   .         .         .         .         .         .         .     * .         .         .         .
 86.7   .         .         .         .         .         .         2 * . 4     .     55.       .
 88.4   .         .         .         .         .       3 .1        .     2 * . 4     .         .         .
 90.1   .         .         .         .         .       3   1       .     * .         .     5.        .
 91.8   .         .         .         .         .         .         . 2   * . 4     .         .         .
 93.5   .         .         .         .         .       3   1       .     * .         .     5         .
 95.2   .         .         .         .         .         .         . 2   * . 4     .         .         .
 96.9   .         .         .         .         .       3   1.      .     * .         .         .         .
 98.6   .         .         .         .         .         .         .     * .         .         .         .
100.3   .         .         .         .         .         .         .     * .         .         .         .
102.0   .         .         .         .         .         .         .     * .         .         .         .
103.7   .         .         .         .         .         .         .     * .         .     5 .        .
105.4   .         .         .         .         .         .         . 2   * . 4     .         .         .
107.1   .         .         .         .         .3        1   .     .     * .         .         .         .
108.8   .         .         .         .         .         .         .     * .         .         .         .
110.5   .         .         .         .         .         .         .     * .         .         .         .
112.2   .         .         .         .         .         .         . 2   * 4       .     5   .         .
113.9   .         .         .         .         .       3.   1      .     * .         .         .         .
115.6   .         .         .         .         .         .         .     * .         .         .         .
117.3   .         .         .         .         .         .         .     * .         .     .5        .
119.0   .         .         .         .         .         .         . 2   * 4       .         .         .
120.7   .         .         .         .       3   1       .         .     * .         .     5         .
122.4   .         .         .         .         .         .         .     * .         .     5         .
124.1   .         .         .         .         .         .         2     * . 4     .         .         .
125.8   .         .         .         .       3   1       .         .     * .         .         .         .
127.5   .         .         .         .         .         .         .     * .         .         .         .
129.2   .         .         .         .         .         .         .     * .         .         .         .
130.9   .         .         .         .         .         .         .     * .         .         .         .
132.6   .         .         .         .         .         .         .     * . 4   .         . 5        .
134.3   .         .         .         .       .   1       .         2     * .         .         .         .
136.0   .         .         .         .   3     .         .         .     * .         .         .         .
137.7   .         .         .         .         .         .         .     * .         .         .         .
139.4   .         .         .         .         .         .         .     * .         . 4     .         5
141.1   .         .         .         .         .         .       2 .     * .         .         .         .
142.8   .         .         .       3.        .   1       .         .     * .         .         .         .
144.5   .         .         .         .         .         .         .     * .         .         .         .
146.2   .         .         .         .         .         .         .     * .         .         .         .
147.9   .         .         .         .         .         .         .     * .         .         .         .
149.6   .         .         .         .         .         .         .     * .         .         .         .
151.3   .         .         .         .         .         .         .     * .         .         .         .
153.0   .         .         .         .         .         .         .     * .         .         .         .
154.7   .         .         .         .         .         .         .     * .         .         .         .
156.4   .         .         .         .         .         .         .     * .         .       .5    4   .
158.1   .         .         .         .         .         .         .     * .         .       .   4    .
159.8   .         .         .         .         . 2       .1        .     * .         .       . 5       .
161.5   .         .         .         .3        . 2       .1        .     * .         .         .         .
163.2   .         .         .       3 .         .         .         .     * .         .         .         .
164.9   .         .         .         .         .         .         .     * .         .         .         .
166.6   .         .         .         .         .         .         .     * .         .         .         .
168.3   .         .         .         .         .         .         .     * .         .         .         .
170.0   .         .         .         .         .         .         .     * .         .         .         .
```

MAP SUBAREA SUMMARY FOR  FRENCH BROAD, ROSMAN  (MAP-0343990 ).  PERIOD OF RECORD  10/1959 THRU 09/1961.

| WATER YEAR | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1960 | 12.80 | 3.16 | 5.79 | 6.84 | 9.15 | 7.85 | 4.30 | 3.81 | 6.58 | 4.37 | 9.21 | 6.48 | 80.33 | |
| 1961 | 6.11 | 1.16 | 3.36 | 2.82 | 11.06 | 7.05 | 5.73 | 4.66 | 9.60 | 7.27 | 17.96 | 2.30 | 79.08 | |
| | 9.46 | 2.16 | 4.57 | 4.83 | 10.11 | 7.45 | 5.01 | 4.23 | 8.09 | 5.82 | 13.59 | 4.39 | 79.71 | IN |

WINTER SEASON TOTAL  (OCT -APR ) =  43.59  IN

SUMMER SEASON TOTAL  (MAY -SEP ) =  36.12  IN

Figure 2. Sample output from program MAP

```
   MAP SUBAREA SUMMARY FOR  BLANTYRE LOCAL      (MAP-0344300 ).  PERIOD OF RECORD  10/1959 THRU 09/1961.

WATER      OCT     NOV     DEC     JAN     FEB     MAR     APR     MAY     JUN     JUL     AUG     SEP       TOTAL
YEAR

1960     11.30    2.56    5.20    6.33    9.13    7.57    4.19    3.74    6.92    4.93    9.11    5.18      76.15
1961      6.96    1.06    3.32    2.91    9.47    6.46    5.55    4.91    9.72    8.11   19.00    2.19      79.65

          9.13    1.81    4.26    4.62    9.30    7.01    4.87    4.33    8.32    6.52   14.05    3.68      77.90  IN

                                                                WINTER SEASON TOTAL  (OCT -APR )  =   41.00  IN

                                                                SUMMER SEASON TOTAL  (MAY -SEP )  =   36.90  IN
************************************************************************************************************************

           COMPLETION CODE =  0

           CPU   TIME USED =    0 MINUTES,  9 SECONDS

           CLOCK TIME USED =    0 MINUTES, 18 SECONDS

************************************************************************************************************************
```