II.6-OFS-MAP OPERATIONAL FORECAST SYSTEM MEAN AREAL PRECIPITATION PREPROCESSOR FUNCTION (MAP)

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Purpose

The Operational Forecast System (OFS) Mean Areal Precipitation Preprocessor Function MAP computes 6 hour mean areal precipitation.

The computations are done for the observed data period (the value of Hydrologic Command Language Techniques STARTRUN through LSTCMPDY).

The data used by MAP are:

- total daily (or current portion of the day for partial days) precipitation
- incremental precipitation for 1, 3 or 6 hour intervals
- 6 hour summations from MDR

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Processing Steps

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I. For each full or partial day:

A. Read data and make preliminary checks:

1. Can daily total be used (i.e. check if time associated with observation is the same as the end of the day)?
   - o If yes okay to use.
   - o If not only use if Technique PP24TIME is off.

2. Is daily total or sum of incremental values greater than upper limit (Technique PP24MAX)?
   - o If yes set values to missing.

B. If MDR can be used convert MDR values to precipitation estimates:

1. For a 6 hour period compute for each station with a 6 hour precipitation observation the gage/radar ratio for each of three precipitation versus MDR tables.

2. Compute the average gage/radar ratio for all stations with observed data for each of the three relationships.

3. Select the relationship that has an average gage/radar ratio closest to 1.0.

4. Use the selected relationship to convert all MDR values to precipitation values.

C. Preliminary adjustments and estimates:

1. Apply correction factors to all non-zero amounts.

2. Set missing data to zero if 'ZERO' option selected for station.

3. Convert all 1 and 3 hour stations to 6 hour stations.

4. When daily total is missing and all incremental values are available set daily total equal to sum of incremental values.

5. If more than one station is at the same location estimate one from another whenever possible.

6. If Technique MDREST24 is greater than zero set missing daily totals to zero when all MDR values for the day are zero for the grid box where the station is located.

D. Estimate missing daily totals for stations that only report daily data:

1. If Technique MDREST24 is greater than 1 try to estimate from the associated MDR grid box (MDR must be available for the whole day).

2. If still missing use surrounding stations (estimators are

stations with observed daily totals).

$$P_x = \frac{\sum_{i=1}^{n} P_i * \frac{\overline{P}_x}{\overline{P}_i} * w_i}{\sum_{i=1}^{n} w_i}$$

where P is the precipitation
x is the station being estimated
I is the estimator station
$\overline{P}$ is the mean or normal monthly precipitation (station characteristic)
w is the weight
n is the number of estimators

Weighting options are:

- $w = 1/**2_{ix}$ (maximum number of estimators is 4)
- $w_i = S_{ix}$ (significance weight)

  where d is the distance

Characteristic options are:

- If not available for station x or for both stations the:

  $\overline{P}_x/\overline{P}_i$ term is not included

- If station x has characteristics but station I does not:

  $\overline{P}_1 = \overline{P}_x$

For 1/d**2 weighting option the station selection criteria are based on Technique CONVEC:
- If Technique CONVEC is off the closest station in each quadrant is used
- If Technique CONVEC is on only stations within a specified radius are used.

For 1/d**2 weighting option the method of dealing with quadrants with no estimators is controlled by Technique ESTTULSA:
- If ESTTULSA is off quadrants with no estimators are ignored and all weight is assigned to quadrants with a station that has observed data.
- If ESTTULSA is on quadrants with no estimators with observed data are assigned a precipitation value of zero and a weight equal to 1/d**2 using the distance associated with the second closest station or the convective radius (if CONVEC on) whichever is

smaller.

3. If still missing (i.e. no available estimators with observed data) set daily total to zero.

E. Calculate normalized values and estimate missing data for stations with 6 hour data:

1. Normalize values for stations with some observed 6 hour data if possible:
   - o If some missing 6 hour data and daily total missing or less than a minimum value (see Section VI.3.3B-DEFINE-USER [Hyperlink]) set 6 hour values to missing.
   - o If only one missing 6 hour value and daily total is available calculate missing 6 hour as difference between daily total and sum of existing 6 hour values. Set to zero if difference is less than or equal to zero.
   - o If all 6 hour values are available compute normalized values:

$$N(j) = \frac{P(j)}{\sum_{j=1}^{m} P(j)}$$

where N is the normalized value
j is the period of the day
m is the number of 6 hour periods in the day

2. Estimate missing daily totals:
   - o Use same procedure as for stations with only daily reports (see steps in I-D [Hyperlink]).

3. Estimate missing normalized values:
   - o If MDR data are available for the whole day the sum of the MDR derived precipitation is greater than a minimum value and Technique MDREST6 is on use equation in I.E.1 to compute normalized values where P is the MDR derived precipitation.

$$N_x(j) = \frac{\sum_{i=1}^{n} N_i(j) * 1/d_{ix}^2}{\sum_{i=1}^{n} 1/d_{ix}^2}$$

   - o If not obtained from MDR estimate normalized values from surrounding stations:
   - o If no surrounding stations available with normalized values computed from observed data set to uniform distribution.
   - o For stations with some observed 6 hour values and an observed daily total compute normalized values for periods with observed 6 hour data as:

$$N(j) = \frac{P(j)}{P_t}$$

where t is the daily total

For remaining periods use normalized values estimated from surrounding stations adjusted to sum to 1.0 minus the sum of the normalized values computed from observed data.

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II. For each MAP area:

A. Compute daily MAP amount:

1. If Technique MDRONLY is on and all MDR derived precipitation values are available for all grid boxes covering the area compute by summing MDR derived precipitation for the day and dividing by the number of boxes.

2. Compute from observed/estimated station data using station weights (see Section VI.3.3B-DEFINE-AREA [Hyperlink]).

B. Distribute daily MAP into 6 hour periods:

1. If Technique MDRDIST is on and all MDR values are available and are not all zero use the MDR boxes assigned to the area to distribute the daily MAP.

2. Distribute based on observed/estimated values for the station in each quadrant closest to the centroid of the basin.

$$N_a(j) = \frac{\sum_{i=1}^{n} N_i(j) * 1/d_{ia}^2}{\sum_{i=1}^{n} 1/d_{ia}^2}$$

$$MAP(j) = N_a(j) * MAP_t$$

where a is the MAP area centroid
MAP is the mean areal precipitation

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