

V.3.3-MEAN-Q MEAN DISCHARGE COMPUTATION OPERATION

Identifier: MEAN-Q

Application: All programs

Description: This Operation computes mean discharges from instantaneous discharges for the specified data time interval.

The instantaneous discharges must be uniformly spaced with data time intervals evenly divisible into the mean discharge data time interval. Mean subinterval discharges are computed for n subintervals using the following equation:

$$n = \Delta T / \Delta t$$

where ΔT and Δt are the mean and instantaneous discharge data time intervals in hours

Mean subinterval discharge (q_m) is computed using the following equation:

$$q_m = 0.5 (q_1 + q_2)$$

where subscripts 1 and 2 indicate the beginning and end of a subinterval

Mean discharge (Q_m) in CMS is computed as the sum of the mean subinterval discharges divided by the number of subintervals using the following equation:

$$Q_m = \frac{\sum_{i=1}^n q_{m_i}}{n}$$

The special provisions of this Operation include the following:

1. The data time interval of the mean discharge time series must be an even multiple of the instantaneous discharge time series data time interval.
2. The mean discharge time series must correspond with even daily data time intervals based on the internal clock. For example, a 12 hour mean discharge time series would be computed for internal clock hours 0-12 and 12-24, not 6-18 and 18-6.
3. Initial carryover values can be specified by the user. The number of carryover values is equal to the mean discharge data time interval divided by the instantaneous discharge data time

interval. The number of carryover values actually used by the Operation is determined by the initial hour of the computations. The default initial carryover values are zeroes.

Allowable Data Time Intervals: 1, 2, 3, 4, 5, 6, 8, 12 and 24 hours

Time Series Used: Time series used in this Operation are as follows:

<u>General Type</u>	<u>Dimn</u>	<u>Units</u>	<u>Use</u>	<u>Required</u>	<u>Form of Output T.S.</u>	<u>Data Time Interval</u>	<u>Missing Values Allowed</u>
Instantaneous discharge	L3/T	CMS	I	yes	n/a	any	yes
Mean discharge	L3	CMSD	O	yes	Replaces	any <u>1/</u>	yes <u>2/</u>

1/ The mean discharge data time interval must be an even multiple of the instantaneous discharge data time interval.

2/ Missing values must be allowed in the mean discharge time series if they are allowed in the instantaneous discharge time series.

Input Summary: The card input for this Operation is as follows:

<u>Card</u>	<u>Format</u>	<u>Columns</u>	<u>Contents</u>
1	2X,2A4	3-10	Identifier of instantaneous discharge time series
	1X,A4	12-15	Data type code of instantaneous discharge time series
	3X,I2	19-20	Data time interval of instantaneous discharge time series (units of HR); computational time interval of Operation
	2X,2A4	23-30	Identifier of mean discharge time series
	1X,A4	32-35	Data type code of mean discharge time series
	3X,I2	39-40	Data time interval of mean discharge time series (units of HR)
	3X,I2	44-45	Number of initial carryover values if carryover is to be input; if zero default is initial values of zero

Card number 2 is optional and is used if columns 44-45 of Card number 1 contain a positive value.

2	7F10.4	1-70	Initial carryover values (units of CMS);
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Card Format Columns Contents

repeat Card 2 as many times as is
necessary (7 values per card)

Sample Input and Output: Sample input is shown in Figure 1. Sample output from the parameter print routine is shown in Figure 2. There is no execution routine output.

Error and Warning Messages: The error and warning messages generated by this Operation and the corrective action to take when they occur are as follows:

A. Messages that can occur during setup.

1. ****ERROR**** THE TIME INTERVAL OF THE MEAN DISCHARGE TIME SERIES (XX) IS LESS THAN THE TIME INTERVAL OF THE INSTANTANEOUS DISCHARGE TIME SERIES (YY).

Action: Check the data time intervals of the mean and instantaneous discharge time series and redefine if necessary.

2. ****ERROR**** THE TIME INTERVAL OF THE MEAN DISCHARGE TIME SERIES (XX) IS NOT AN EVEN MULTIPLE OF THE TIME INTERVAL OF THE INSTANTANEOUS DISCHARGE TIME SERIES (YY).

Action: Check the data time intervals of the mean and instantaneous discharge time series and redefine if necessary.

3. ****WARNING**** THE SPECIFIED NUMBER OF INITIAL CARRYOVER VALUES TO BE INPUT (XX) EXCEEDS THE MAXIMUM NUMBER OF VALUES ALLOWED (YY). ONLY THE FIRST YY VALUES WILL BE READ.

Action: Check the value in columns 44-55 on Card 1 and the actual number of carryover values needed by the operation and redefine if necessary.

4. ****ERROR**** THE INSTANTANEOUS DISCHARGE TIME SERIES ALLOWS MISSING DATA. THEREFORE THE MEAN DISCHARGE TIME SERIES MUST ALLOW MISSING DATA.

Action: Use a data type for the mean discharge time series that allows missing data.

B. Message that can occur during carryover transfer.

1. ****WARNING**** NEITHER THE OLD (XX HOURS) NOR THE NEW (YY HOURS) DISCHARGE TIME SERIES TIME INTERVAL IS AN EVEN MULTIPLE OF THE OTHER. NO CARRYOVER VALUES CAN BE TRANSFERRED.

Action: One data time interval must be a multiple of the

other before carryover can be transferred.

Carryover Transfer Rules: The following rules apply to the operation during the carryover transfer process.

1. Carryover values are instantaneous discharge values.
2. If the new and old instantaneous discharge time series data time intervals (ΔT_{new} and ΔT_{old} , respectively) are not equal and
 - a. if ΔT_{new} is a multiple of ΔT_{old} discharge values are adjusted by saving only the values which occur at the end of the new data time intervals
 - b. if ΔT_{old} is a multiple of ΔT_{new} discharge values are adjusted by linearly interpolating between existing values
 - c. if neither ΔT_{new} nor ΔT_{old} is a multiple of the other carryover is not transferred
3. The number of new carryover values is equal to the ratio of the new mean discharge time series data time interval (ΔT_{new}) to ΔT_{old} .
 - a. if ΔT_{new} is greater than ΔT_{old} all carryover values equal -999
 - b. if ΔT_{new} is less than ΔT_{old} the last $\Delta T_{old}/\Delta T_{new}$ positive instantaneous discharge values are saved as carryover
 - c. if ΔT_{new} is equal to ΔT_{old} all the adjusted values become the new carryover values

Punched Card Limitations: The punched card formats for this Operation are as follows. No checks are made to determine if quantities are greater or less than the maximum and minimum values.

<u>Parameters or Variables</u>	<u>Punch Format</u>	<u>Maximum Value</u>	<u>Minimum Value</u>	<u>Precision After Decimal Point</u>
Initial carryover values	F10.4	99999.9999	0.0001	ten-thousandths

Figure 1. Sample Card Input For Operation MEAN-Q

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          - Column -
         5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
MEAN-Q      RESV_INF
RESINFLO SQIN      6 RESINFLO SQME      6

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Figure 2. Sample Output From Operation ?OPNAME? Print Parameter Routine

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*****
MEAN-Q  OPERATION      NAME=RESV_INF      PREVIOUS NAME=
*****

      MEAN DISCHARGE OPERATION

      COMPUTATIONAL TIME INTERVAL IS  6 HOURS.

      TIME SERIES USED BY THIS OPERATION.

      CONTENTS          I.D.          TYPE          TIME INTERVAL
INSTANTANEOUS DISCHARGE RESINFLO      SQIN           6 HOURS
MEAN DISCHARGE          RESINFLO      SQME           6 HOURS

MEAN DISCHARGES ARE COMPUTED FOR  6 HOUR TIME PERIODS.

INITIAL CARRYOVER VALUES HAVE BEEN SET TO THEIR DEFAULT VALUES.

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