

V.3.3-RES-SNGL-SPEC-ADJUST SINGLE RESERVOIR REGULATION OPERATION
UTILITY ADJUST MODEL RESULTS

Purpose

Utility ADJUST allows the user to adjust simulated values based on available observations (including predicted).

Any combination of observed instantaneous discharges, mean discharges and pool elevations can be used. The output consists of adjusted time series for use in subsequent operations and adjusted carryover which should provide a better starting point for a subsequent forecast run.

Input Summary

<u>Keyword</u>	<u>Definition and Format</u>
ADJUST	Input opening keyword for Utility
[<u>P</u> ARMS]	Parameter opening keyword for Utility: - only needed if observed instantaneous time-series is being used
[<u>B</u> LEND]	Integer number of blend steps (defaults to 4). Used to determine method of generating adjusted results between observed instantaneous discharges. If M observed data values are missing then if: M + 1 ≤ Number, by interpolation M + 1 > Number, by blending (forward and/or backward)
[<u>C</u> FACTOR]	Correction factor method used for interpolation between available observed instantaneous discharges; followed by either: [<u>D</u> IFF] - for differences or [<u>R</u> ATIO] - for ratios - defaults to DIFF
[<u>E</u> ND <u>P</u> ARMS]	Ending keyword for parameter input: - only needed if PARS was entered
<u>T</u> IME- <u>S</u> ERIES <u>1</u> /	Time series input opening keyword for Utility
[<u>O</u> BS <u>Q</u>] <u>2</u> /	Observed instantaneous discharge time series: - data time interval = multiple of Operation data time interval - dimensions = L ³ /T - units = CMS

<u>Keyword</u>	<u>Definition and Format</u>
	<ul style="list-style-type: none"> - missing values are allowed - suggested data type = RQOT
[OBSQOM] <u>2/</u>	<p>Observed mean discharge time series:</p> <ul style="list-style-type: none"> - data time interval = multiple of Operation data time interval - dimensions = L3 - units = CMSD - missing values allowed - suggested data type = RQME
[OBSH] <u>2/</u>	<p>Observed pool elevation time series:</p> <ul style="list-style-type: none"> - data time interval = multiple of Operation data time interval - dimensions = L - units = M - missing values allowed - Suggested data type = PELV
[ADJQO] <u>3/</u>	<p>Adjusted instantaneous discharge time series:</p> <ul style="list-style-type: none"> - data time interval = multiple of Operation data time interval - dimensions = L3/T - units = CMS - no missing values allowed - Suggested data type = RQIE or QINE
[ADJQOM] <u>3/</u>	<p>Adjusted mean discharge time series:</p> <ul style="list-style-type: none"> - data time interval = multiple of Operation data time interval - dimension = L3 - units = CMSD - no missing values allowed - Suggested data type = RQMP
[ADJH] <u>3/</u>	<p>Adjusted pool elevation time series:</p> <ul style="list-style-type: none"> - data time interval = multiple of Operation data time interval - dimensions = L - units = M - no missing values allowed - suggested data type = PELE
[ADJS] <u>3/</u>	<p>Adjusted storage time series:</p> <ul style="list-style-type: none"> - data time interval = multiple of Operation data time interval - dimensions = L3 - units = CMSD - no missing values allowed - suggested data type = RSTE
<u>ENDTS</u>	Ending keyword for time series input

<u>Keyword</u>	<u>Definition and Format</u>
[<u>CARRYOVER</u>]	Carryover opening keyword for Utility: - only needed if observed instantaneous discharge time series is used
[<u>QDIFF</u>]	Initial difference (CMS or CFS, equal to observed minus simulated, defaults to zero) or ratio (equal to observed divided by simulated, defaults to one) depending on parameter CFACTOR
[<u>STEPS</u>]	Initial integer number of missing observed data periods: - defaults to 0
[<u>ENDCO</u>]	Ending keyword for carryover input: - only needed if CARRYOVER was entered
ENDADJ	Ending keyword for Utility input

Notes:

- 1/ See 'Time Series Definition' in Section V.3.3-RES-SNGL-SPEC.
- 2/ At least one of the observed time series must be specified.
- 3/ At least one of the adjusted time series must be specified.

Input Examples

1. Adjusted instantaneous outflow based on observed instantaneous discharge.

```

ADJUST
PARMS
BLEND 8
CFACTOR RATIO
ENDPARMS
TS
OBSQO   XYZT2   RQOT   6
ADJQO   XYZT2   RQIE   6
ENDTS
CO
QDIFF   2.0
STEPS   4
ENDCO
ENDADJ

```

2. Adjusted pool elevation based on observed pool elevation.

```

ADJUST
TS
OBESH   ABCT2   PELV   24
ADJH    ABCT2   PELE   6
ENDTS

```

ENDADJ

3. Adjusted pool elevation and instantaneous discharge based on observed mean outflow.

```
ADJUST
TS
OBSQOM  IJKT2    RQME    6
ADJQO   IJKT2    RQIE    6
ADJH    IJKT2    PELE   12
ENDTS
ENDADJ
```

Method

The adjustment procedure is dependent on what observed data are available. All adjustments terminate at the last observed data value. After the last observed data, further adjusted values are simulated using the adjusted carryover at the time of the last observed data value as a starting point. A summary of the method follows (Section II.4-RES-SNGL-A-ADJUST for details):

1. Only observed instantaneous discharges (OBSQO).
 - a. Adjusted instantaneous discharge is equal to observed whenever an observed value is available. When observed data are missing, adjusted instantaneous are generated by linear interpolation or by linear blending. If the number of missing data periods are less than user specified blending number, adjusted instantaneous are interpolated between two adjacent observed values by distributing linearly the differences or the ratios between observed and simulated values. When using ratios, if either the ratio is greater than five or one ratio is more than twice the other, then the differences are used. If the number of missing data periods equal or exceed the blending number, adjusted instantaneous are generated by blending forward or backward from the observed data to simulated instantaneous by linearly distributing the differences.
 - b. Adjusted mean discharge is generated by averaging adjusted instantaneous values.
 - c. Adjusted storage and pool is generated from the continuity equation using adjusted mean outflow and mean inflow.
2. Only observed mean discharges (OBSQOM).
 - a. Generate daily mean discharge from observed mean. If any observed mean is missing in any day, the daily discharge for that day is treated as missing.
 - b. Generate adjusted instantaneous discharge by adjusting simulated instantaneous while conserving the daily discharge

volume determined from observed mean. If daily discharge is missing, adjusted instantaneous is equal to simulated.

- c. Adjusted mean discharge is generated by averaging adjusted instantaneous values.
 - d. Adjusted storage and pool is generated from the continuity equation using adjusted mean outflow and mean inflow.
3. Only observed pool elevations (OBSH).
- a. Generate adjusted pool storage from observed pool elevation and reservoir elevation versus storage curve. When observed data are missing, adjusted pool storages are interpolated by linearly distributing differences between simulated storages and two adjacent storages generated from observed pool elevations.
 - b. Generate adjusted pool elevation from adjusted pool storage and reservoir elevation versus storage curve.
 - c. Generate adjusted mean outflow from the continuity equation using adjusted pool storage and mean inflow.
 - d. Generate daily mean discharge from adjusted mean. Adjusted instantaneous discharges are then generated by adjusting simulated instantaneous while conserving the daily discharge volume determined from adjusted mean.
4. When more than one observed data type is available, a combination of the above procedures are used.
- a. Generate preliminary adjusted instantaneous discharge from observed instantaneous using procedures described in 1a.
 - b. Generate adjusted pool storage from observed pool elevation and reservoir elevation versus storage curve. When observed pool elevations are missing while observed mean discharges are available, adjusted pool storage is generated from the continuity equation. When both observed pool elevations and mean discharge are missing, adjusted pool storages are interpolated by linearly distributing differences between simulated storages and two adjacent adjusted storages generated from observed data.
 - c. Generate adjusted pool elevation from adjusted pool storage and reservoir elevation versus storage curve.
 - d. Generate adjusted mean discharges from observed means. When observed means are missing, adjusted mean is computed from adjusted pool storages and the continuity equation.
 - e. Generate daily mean discharge from adjusted mean. Final adjusted instantaneous discharges are regenerated by adjusting preliminary adjusted instantaneous discharge while

conserving the daily discharge volume determined from adjusted mean.

Special cases that exist are as follows:

1. If the POOLQ Scheme is used and the only observed data specified is pool elevation (OBSH), then for all periods through the last one with observed data, discharges are computed using adjusted pool elevations and the elevation-discharge curve. Continuity is not preserved. After the last observed data, discharges are simulated using the adjusted carryover at the time of the last observed data value as a starting point. This special case should be used only if observed pool elevations are dependable.
2. If the SETQ Scheme is used (by itself or with other Schemes) and the final discharge values are not being adjusted (i.e., only ADJH and/or ADJS specified), the discharge time series and carryover, when SETQ is in effect, are based on the simulated results. In this situation the pool elevation and storage time series and carryover are based on the results from the ADJUST Utility. If the discharge values are being adjusted (i.e., ADJQO and/or ADJQOM specified), all time series and carryover values are based on the results of the ADJUST Utility, thus, the discharge will likely not be the same as specified by the SETQ Scheme.

User Guidelines

In general there can be problems when the adjusted outflow is based on observed pool elevations. Small changes in pool elevation caused by wind or observation errors can result in large fluctuations in outflow. Thus usually observed pool elevation should only be used to generate adjusted pool elevation. An exception is when observed pool elevations are used with the POOLQ Scheme.