

Examples and Applications of API-CONT Modifiers

Adapted from information from MARFC

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This document provides a general overview of the Continuous Antecedent Precipitation Index (API-CONT) modifiers, or “mods”, available within the Community Hydrologic Prediction System (CHPS).

Mods make run-time adjustments to the states, time series, or parameters within the model. Making mods may be necessary for a number of reasons in the forecast process:

- Model assumptions are not always valid. For instance, unit hydrograph theory assumes a uniform distribution of precipitation in space and time, which is typically not true.
- Data quality issues can frequently require real time adjustment. Ideally, these should be caught prior to the hydrologic forecast; however, real time adjustments are not always feasible.
- Models cannot completely represent all physical conditions.
- Adjustments may be necessary to match river flows.
- Information from water partners (e.g., reservoir release information) may be provided by a reservoir operator to override the operating rules on which the model is based.

A number of mods are available to the forecaster at run time. Depending on the model used to generate the forecast and data type in a time series, mods may not always be available.

.APICBASF

The APICBASF modifier changes the baseflow value in the API-CONT model. The mod changes the baseflow by the multiplier specified (percent basis).

Note: This mod takes effect one period after the date/time specified.

A reduction of 10% would have a value of 0.90. An increase in baseflow would be 1.10. Because the model converts baseflow to inches of runoff and routes it through the Unit Hydrograph (UHG), make changes to the day or two before the period in question. Convention says use 12Z as the start time, although any period can be used.

Since changes are UHG based, basins with longer UHG take longer for maximum effect, shorter UHGs are faster.

.APICCO

This modifier is used to change a content, deficit, or index value in the model/ alter model states (such as API, SMI, baseflow storage contents). Operational testing has not yielded much benefit other than resetting model states mistakenly changed in previous runs, such from bad precipitation values.

This modifier uses keywords to determine which state to change:

API: changes API value.

SMI: changes SMI value.

BFSC: changes the baseflow values. Note this also alters the recession rate of the baseflow.

BFI: changes the relationship of the primary to supplemental baseflow. This is like the negative image of BFSC because it also changes the volume of flow.

.CHGBLEND

Used to change the number of time steps the modified model simulation is blended into the actual model simulation.

.IGNORETS

Set a time series to ignore using this modifier. A time series may need to be set to ignore due to erroneous data, gage operating limits, ice jams, or rating curve problems.

.MFC

Use this modifier to adjust the rate of melt the snow model (SNOW-17) will computed on a simulated snowpack.

Recommended values are between 0.5 and 5.0.

This mod is only effective during a time step when both melt is occurring and there was no rain.

The forecaster should be careful in assuming all error in the runoff simulation is due to an improper melt rate.

As in baseflow values per square mile, look for consistency. If a forecaster uses an MFC value for a basin much different from surrounding basins, then perhaps the simulated runoff problem is the result of a factor other than MFC.

The MFC is used for maintaining the simulation of a snowpack over long periods and should not be sacrificed for the short-term goal of 6 to 18 hours of runoff, unless the forecaster can determine and unusual melting process is occurring.

.RAINSNOW

The RAINSNOW modifier sets the storm type precipitation to rain or snow.

Since the snow model cannot handle sleet or freezing rain, the convention is to treat sleet as snow and freezing rain as rain.

If significant amounts of sleet occur, be prepared for higher than usual MFC values in the future since the snowpack will have a higher density and ripeness than simulated.

In a freezing rain situation, the forecaster should plan to reduce the resulting runoff by as much as 75 to 90%. Glaze on the basin's terrain can remain for a few days as it slowly melts. This makes the precipitation the equivalent of drizzle or very light rainfall, which produces very light runoff.

.ROCHNG

Change the amount of runoff using this modifier. If using this mod for future time steps, set the valid date as the current run time so the 'predicted' value given in the mod will not be used at the next run time.

.ROMULT

Use ROMULT to change the amount of runoff using a multiplier (percent basis). If using this mod for future time steps, set the valid date as the current run time so the 'predicted' value given in the mod will not be used at the next run time.

.RRICHNG

Change the amount of precipitation using this modifier.

Since this mod changes liquid input to the model, this mod affects both surface discharge and baseflow.

This mod is best used when changing the timing of the rain (+melt) or removing nuance rainfall (sprinkles).

Otherwise, this mod should only be used when convection or extreme variability of the rainfall distribution calls the MAP calculations into question.

Besides changing both surface runoff and baseflow, the basin API is altered. This can have a negative effect on runoff computation for future events.

When the forecaster is satisfied with the MAP, the modifiers .ROCHNG and .APICBASF should be applied. If using this mod for future time steps, set the valid date as the current run time so the 'predicted' value given in the mod will not be used at the next run time.

.RRIMULT

Used to change the amount of precipitation by a multiplier (percent basis).

Since this mod changes liquid input to the model, this mod affects both surface discharge and baseflow.

This mod is best used when changing the timing of the rain (+melt) or removing nuance rainfall (sprinkles).

Otherwise, this mod should only be used when convection or extreme variability of the rainfall distribution calls the MAP calculations into question.

Besides changing both surface runoff and baseflow, the basin API is altered. This can have a negative effect on runoff computation for future events. When the forecaster is satisfied with the MAP, the modifiers .ROCHNG and .APICBASF should be applied.

If using this modifier for future time steps, set the valid date as the current run time so the 'predicted' value given in the mod will not be used at the next run time.

.SETQMEAN

Use this modifier to override the normal rules for reservoir operations. The future reservoir releases are set up in the forecast program to continue the last observed discharge, unless a scheduled release has been SHEF encoded to the database.

.SWITCHTS

SWITCHTS designates which precipitation time series (MAP or MAPX) to use when making a forecast run. This is beneficial in areas with limited gage or radar beam blockage.

.UADJ

The UADJ modifier adjusts the melt rate during a rain on snow time step.

The calibrated melt rate in rain events was determined by an average rate over a 10-year period of study of wind and dew points.

Any time a forecaster suspects conditions significantly different from 'normal', such as very windy and warm (value > 1.0) or a drizzle, just above freezing with no wind (value < 1.0), this modifier can be used.

The forecaster should be careful in assuming all error in the runoff simulation is due to an improper melt rate.

As in baseflow values per square mile, look for consistency. If a forecaster uses an UADJ value for a basin much different from surrounding basins, then perhaps the simulated runoff problem is the result of a factor other than MFC.

The UADJ is used for maintaining the simulation of a snowpack over long periods and should not be sacrificed for the short-term goal of 6 to 18 hours of runoff, unless the forecaster can determine and unusual melting process is occurring.