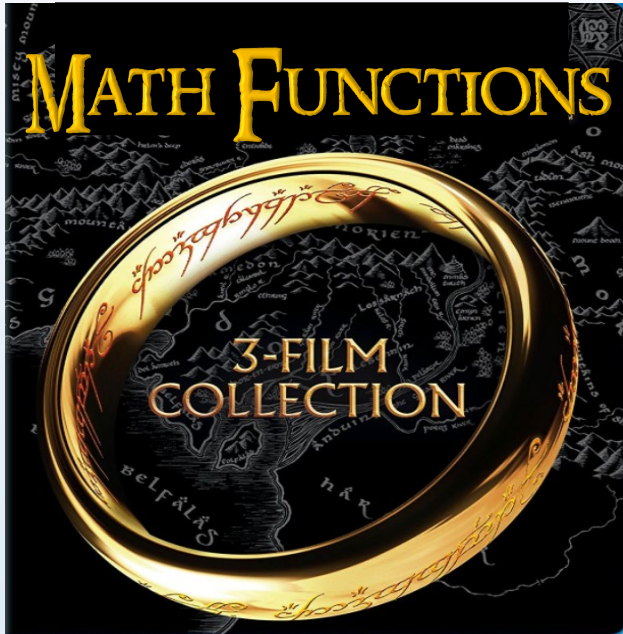


HEC-DSSVue Math Functions



Interactive Data Manipulation
Part 1 of the Epic Trilogy!



HECDSS-Vue Math Functions

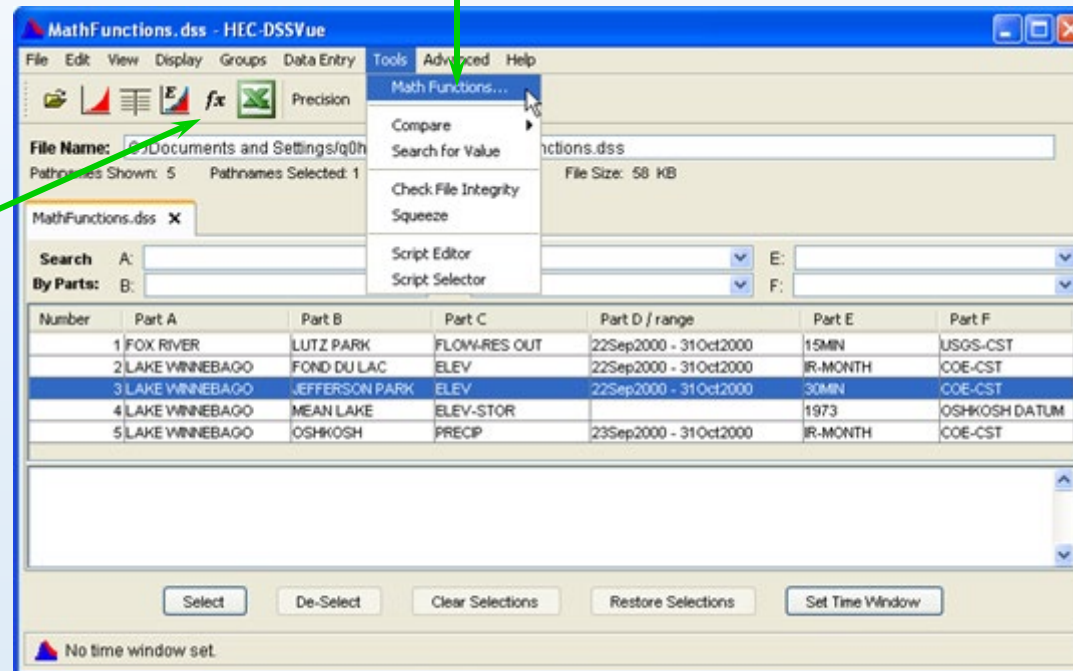
Part 1 - *“Where it all begins . . .”*

- Successor to DSSMath
 - Basically same functionality with some enhancements, clarifications, or rearrangements
 - Over 50 math functions available
 - No migration tools available
- Interactive or scripted
 - Interface accessed through DSSVue GUI
 - Jython language opens up entire set of objects and methods

Accessing Math Functions

- Select the pathnames on which the Math Functions will operate
- Choose the Tools->Math Functions menu

➤ Alternately, choose the Math Functions icon from the Menu Bar



Math Functions Screen

The screenshot shows the 'Math Functions' application window. It features a menu bar with 'File', 'Edit', and 'Display' options. Below the menu bar is a toolbar with icons for file operations and a graph. A dropdown menu shows the 'Selected Data Set' as '/FOX RIVER/LUTZ PARK/FLOW-RES OUT/01SEP2000/15MIN/USGS-CST/'. There are tabs for 'Arithmetic', 'General', 'Time Functions', 'Hydrologic', 'Smoothing', and 'Statistics'. The 'Arithmetic' tab is active, showing an 'Operator' dropdown set to 'Add'. Below this are radio buttons for 'Constant' (selected) and 'Data Set'. A text area contains a list of data set paths. At the bottom, there is a 'Compute' button and a message bar that says 'No Constant entered.'

Menu Bar

Menu Bar Buttons

Selected Data Set Window

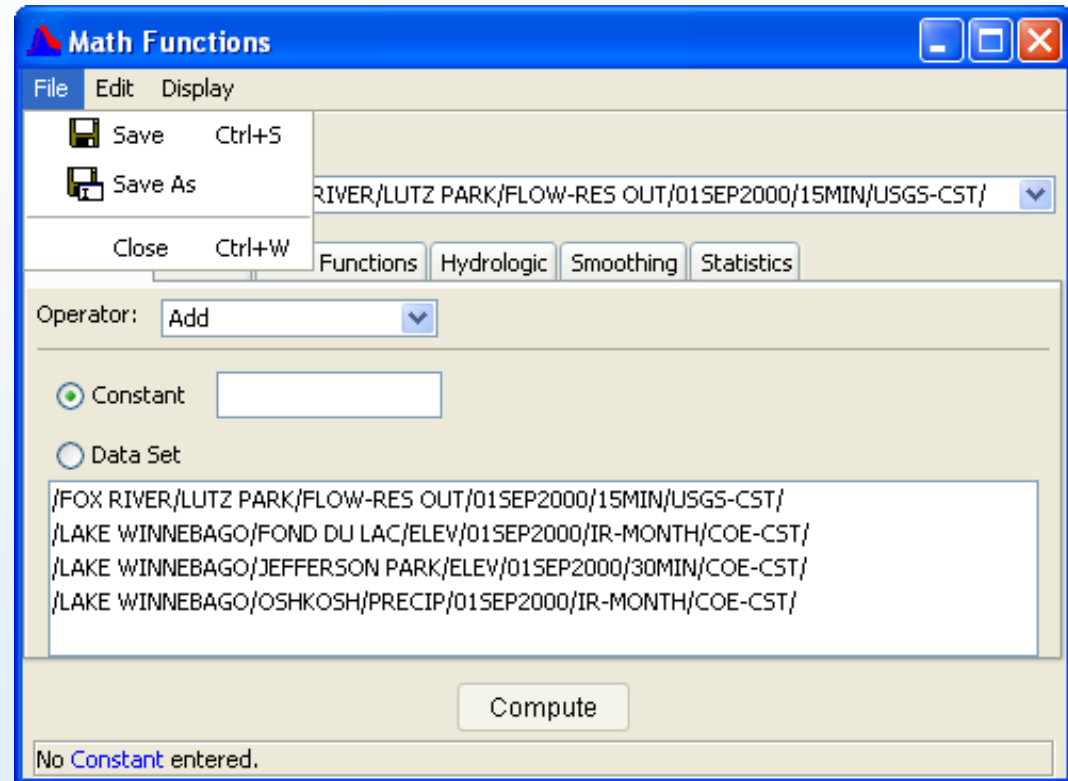
Operation Definition

Message Bar

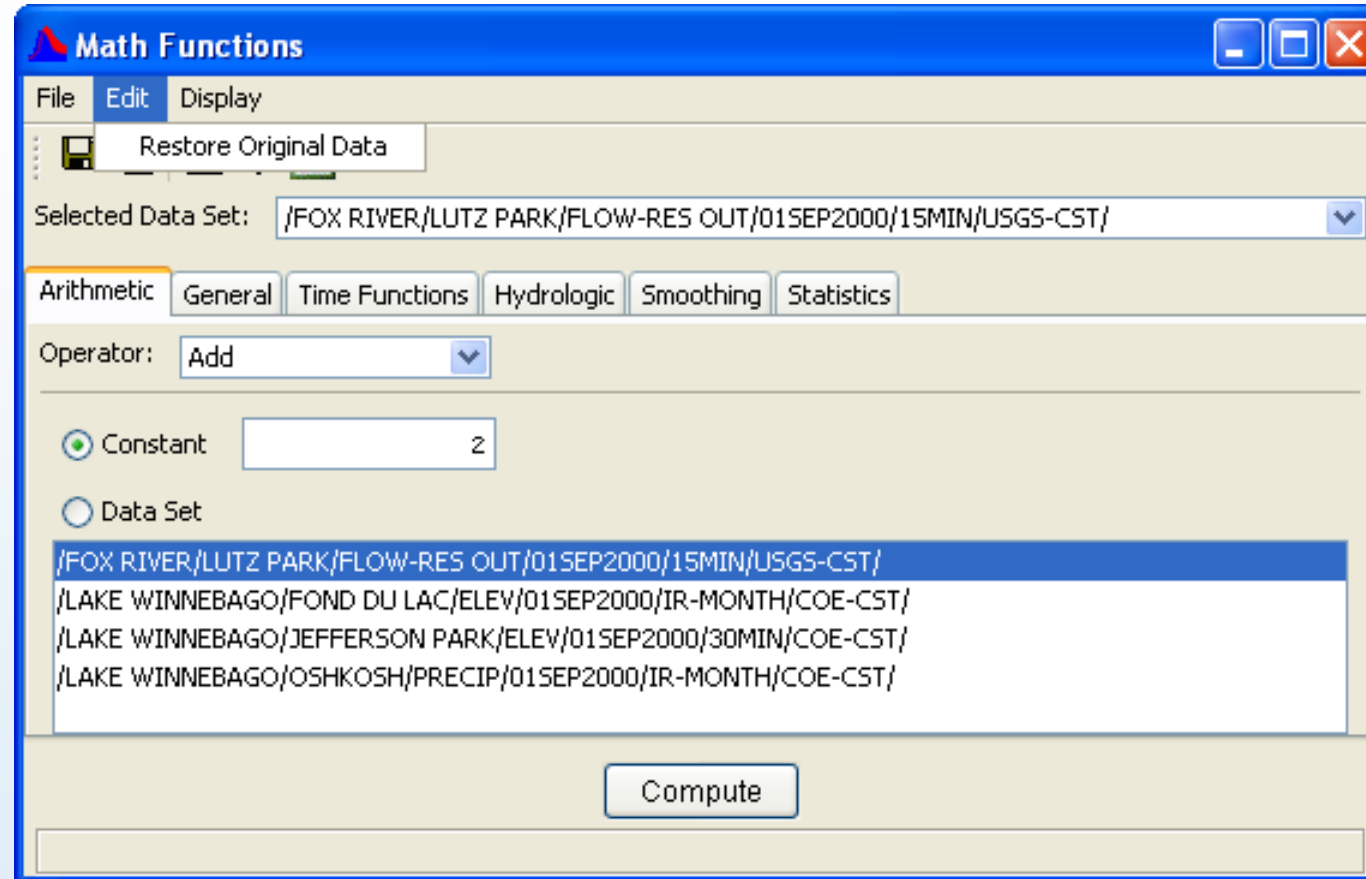
Compute Button

File Menu

- Saves the modified data in original pathname, or with user-designated changes to pathname parts
- Exits Math Functions screen



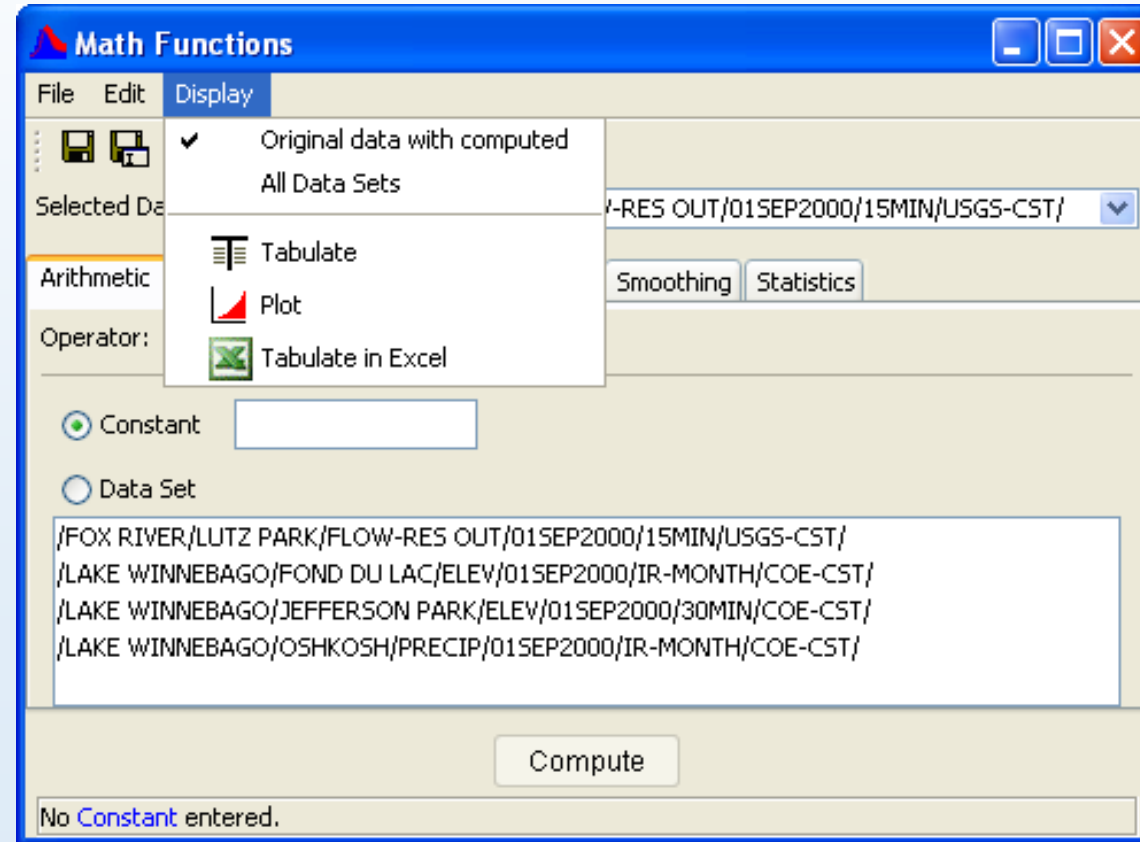
Edit Menu



'Restore Original Data' menu item abandons any unsaved edits to selected data set.

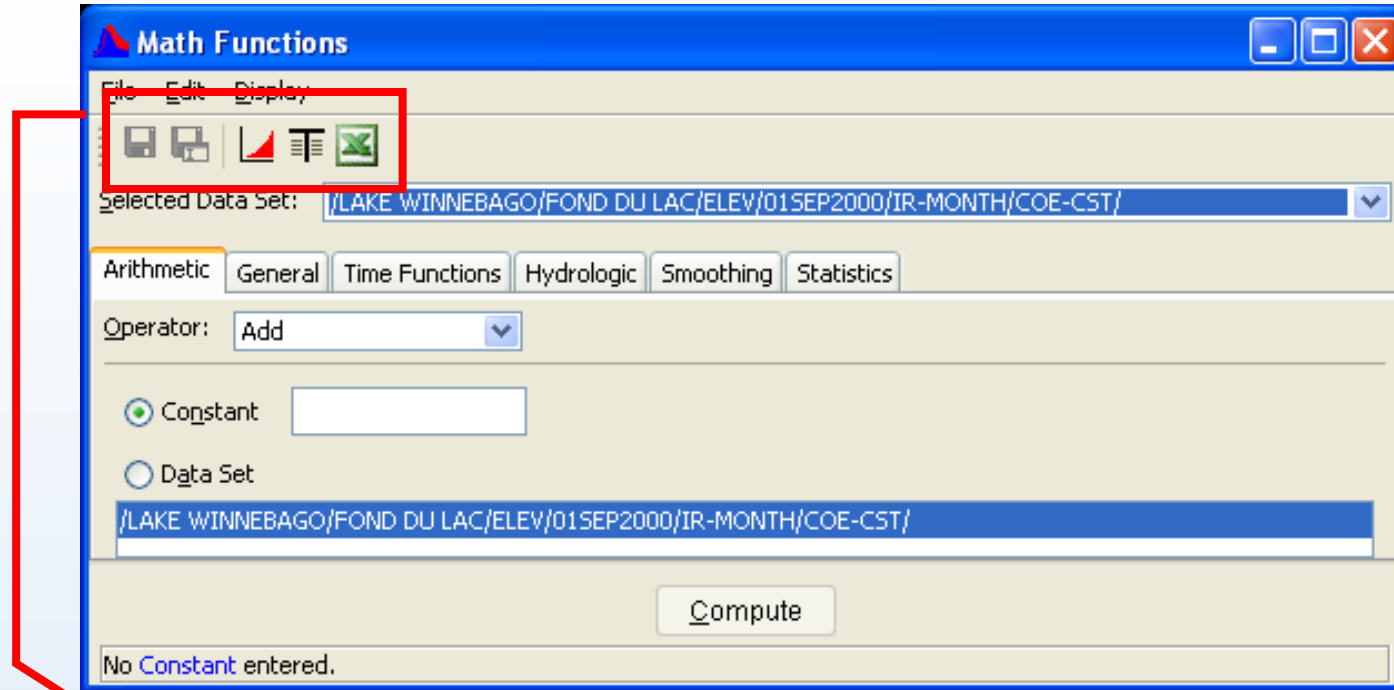
Display Menu

Choices in the upper portion of Display menu are toggles for controlling which data sets get tabulated or plotted.



Lower choices pop up tables or plots of the chosen data.

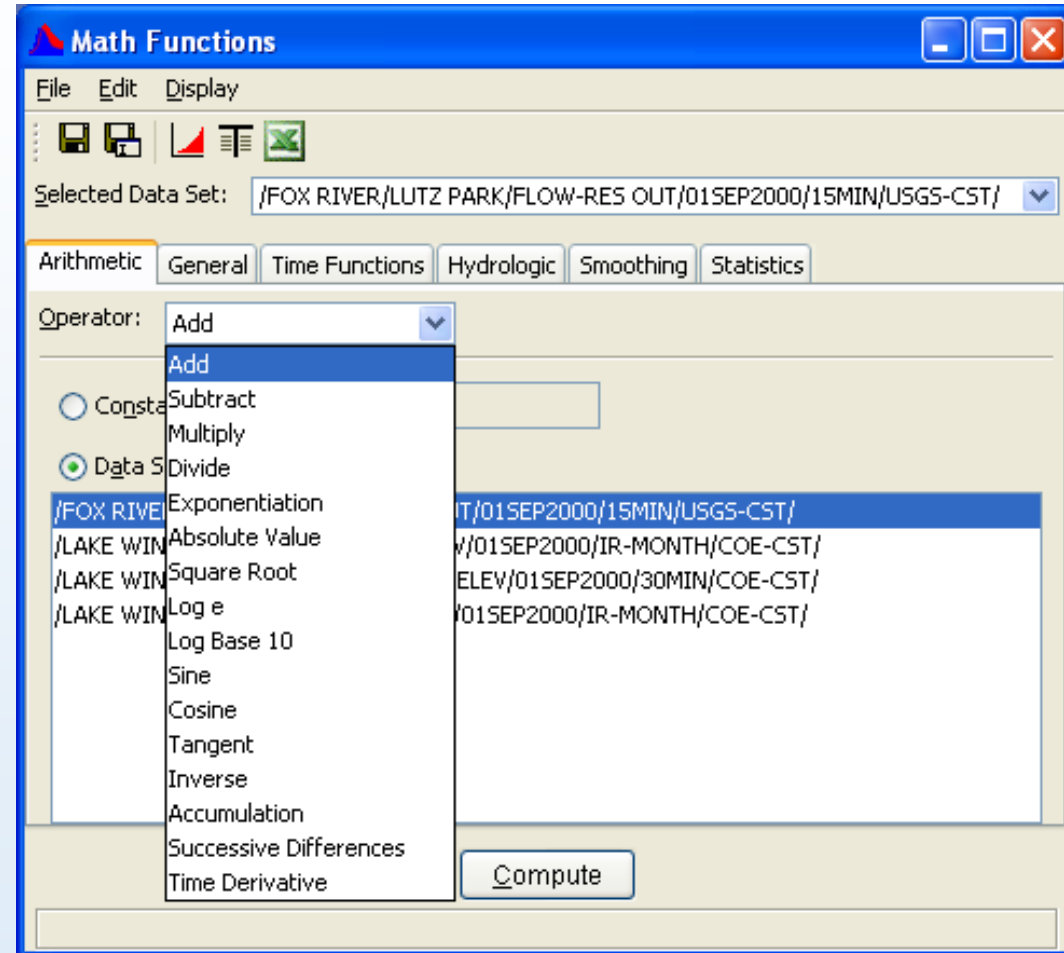
Toolbar



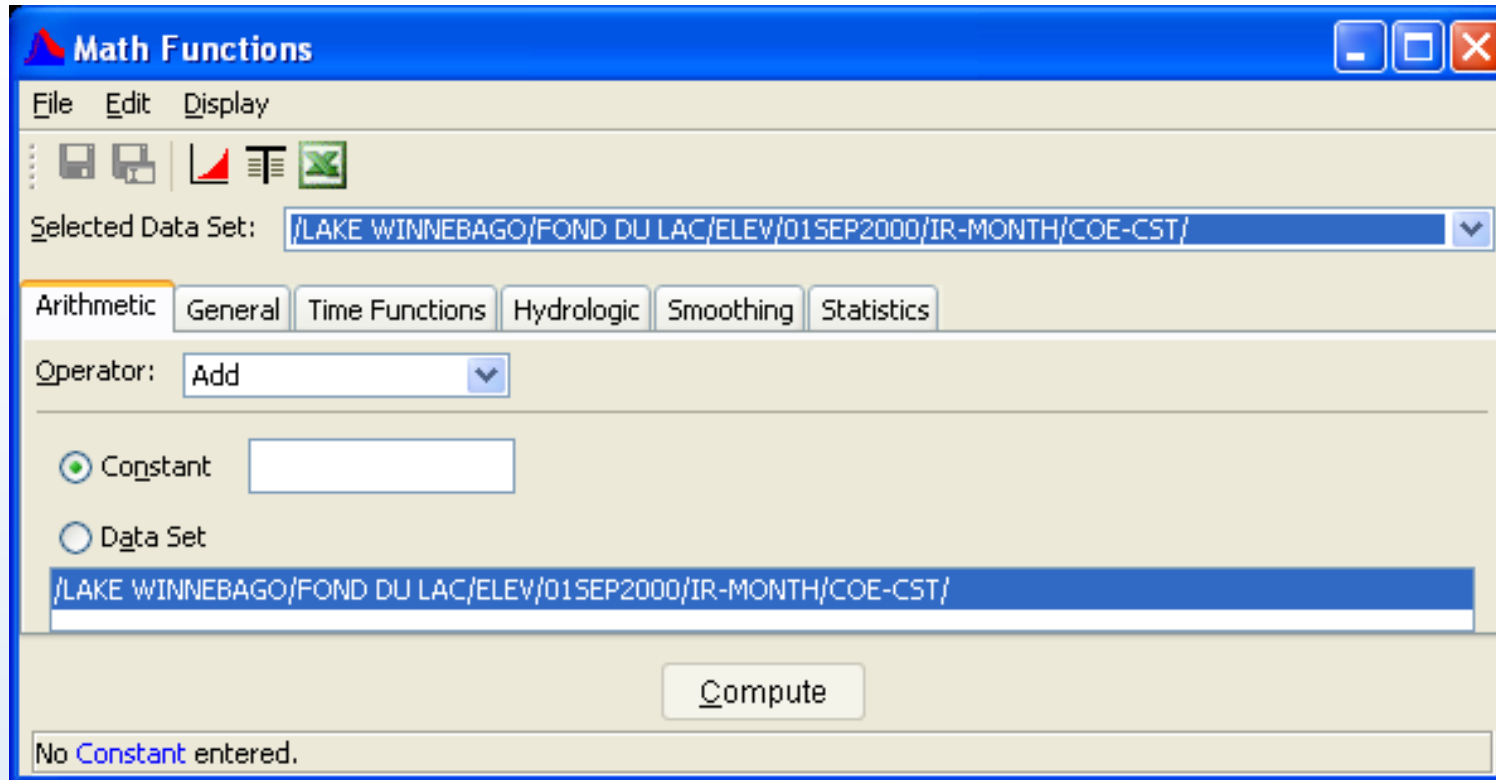
Alternate mechanisms for File/Save, File/Save As, Display/Plot, and Display/Tabulate.

Operator Selection

- Select the operator from the pull down menu.
- Many operators need two data sets for the computation
 - Selected is the primary
 - Choose secondary from lower screen



Selected Data Set



List contains paths selected when Math Functions module launches.
Selected line becomes the data set in memory

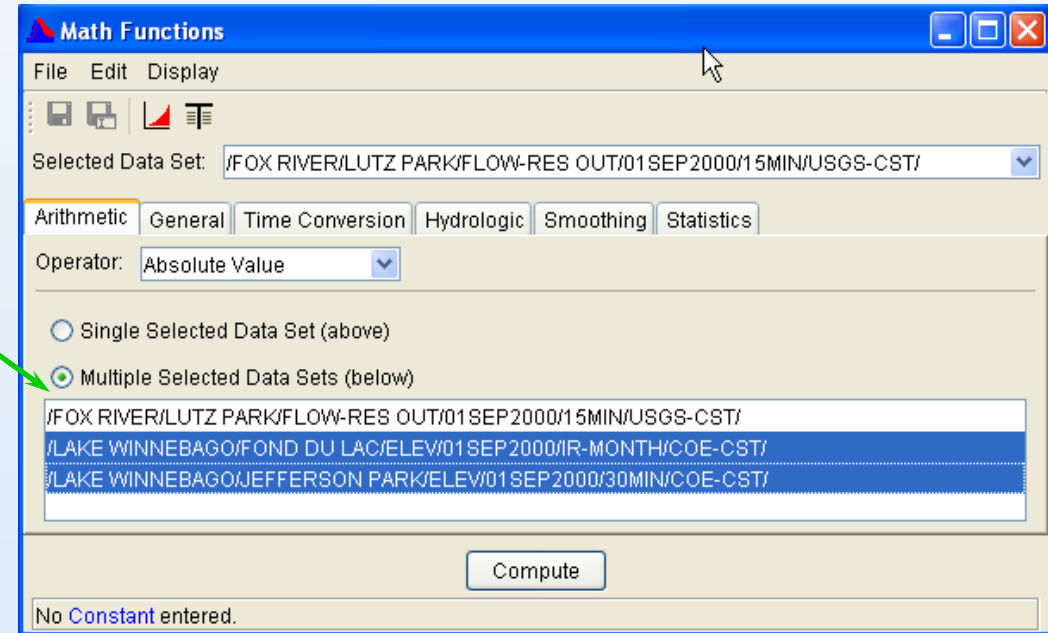
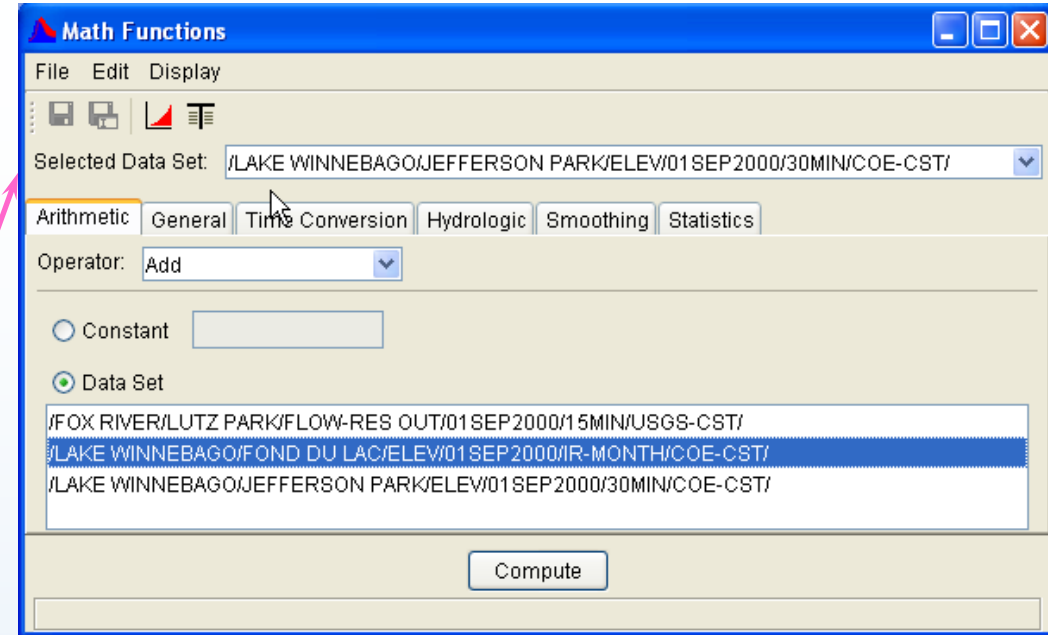
Selected Data Sets

- Choose from paths selected when Math Functions module launches.
- Some functions permit an operation to be applied simultaneously to multiple data sets.

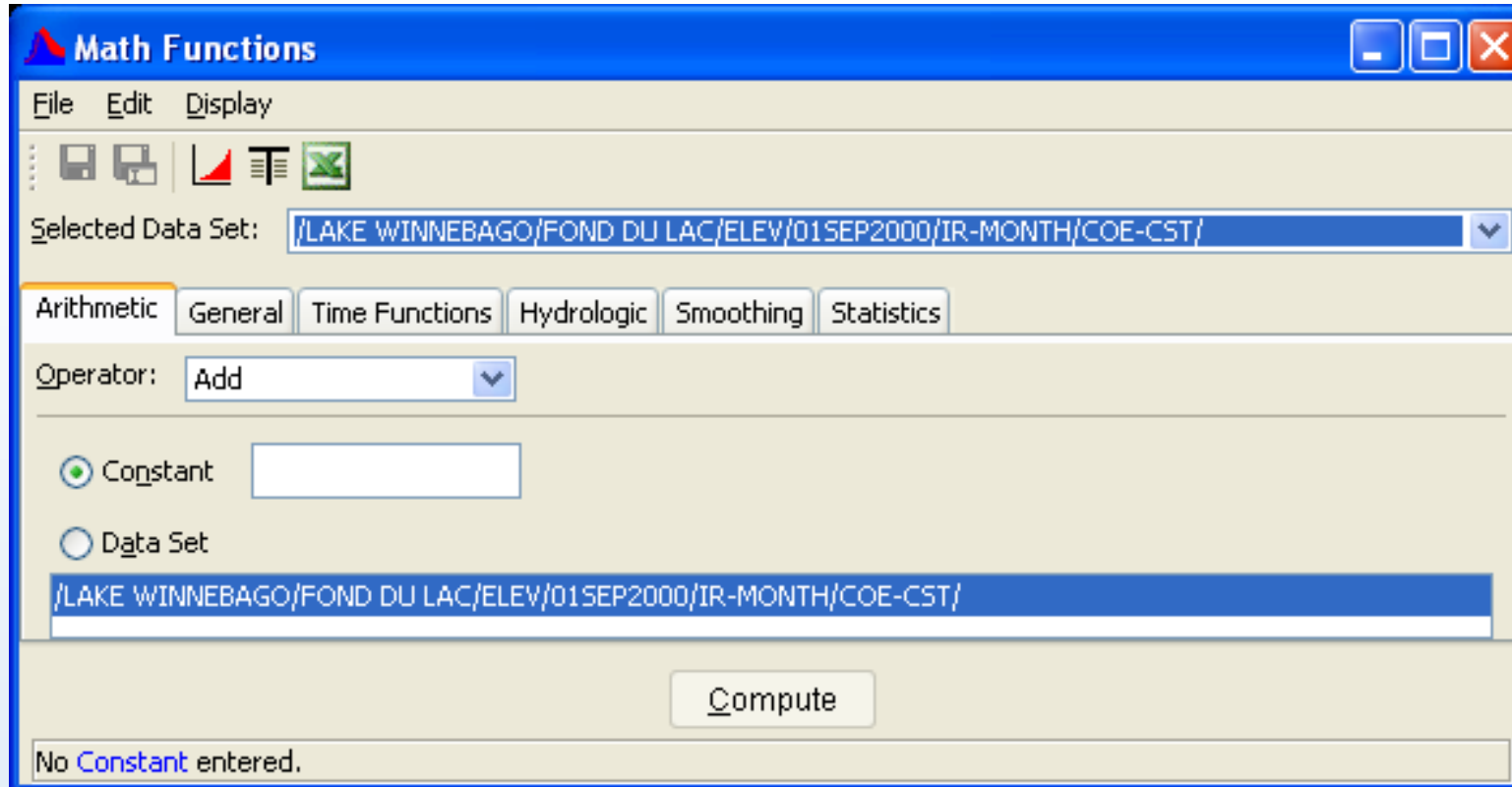
single selection function

multiple selection function

- Selection(s) become the data set in memory



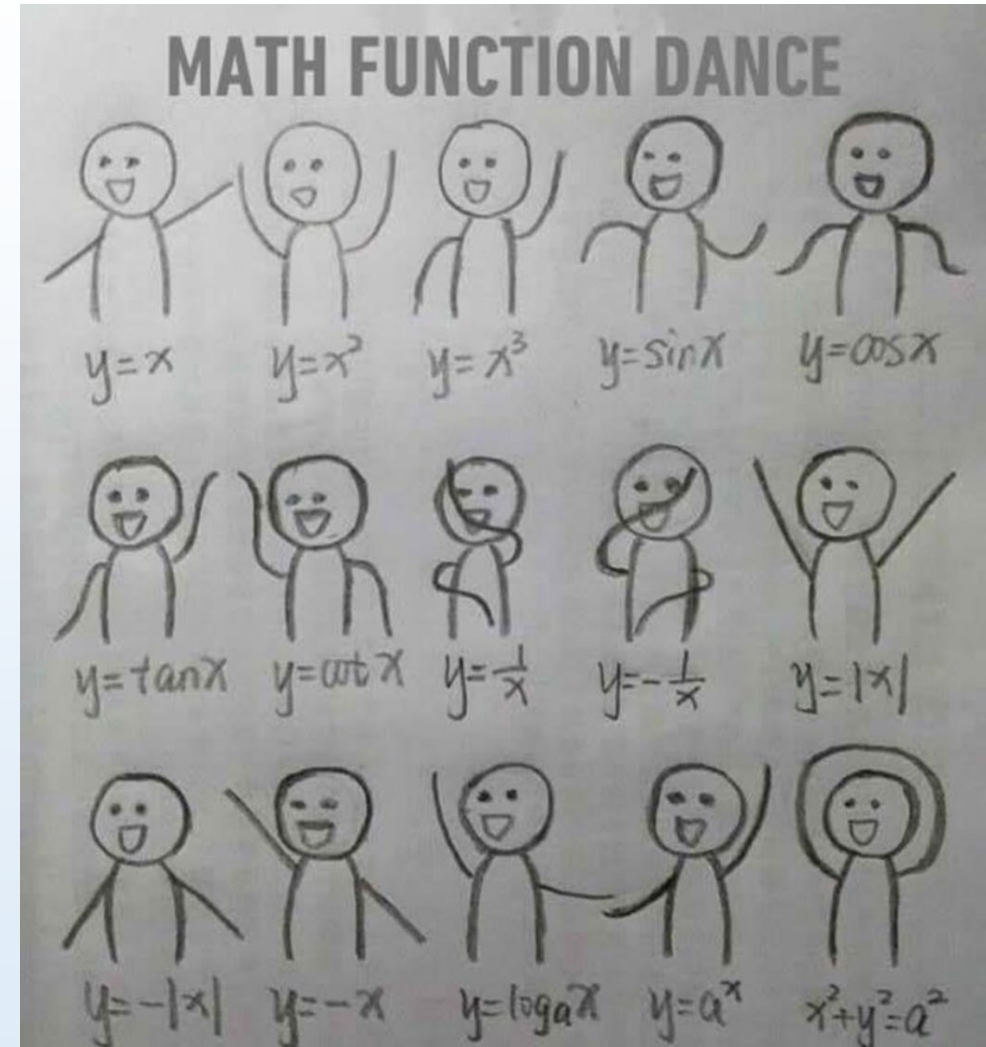
Functions and Operators



- Each of six tabs contains a number of operators.
- Drop down menu contains list of operators in that category
- Some operators specific to time-series or paired data.
- Parameters vary between operators.

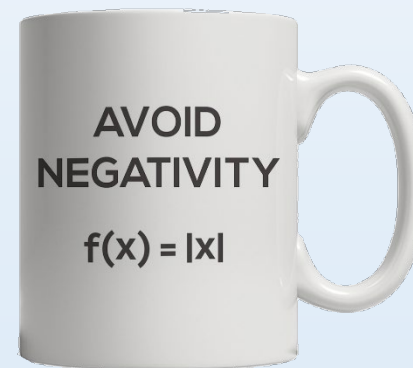
Math Functions Categories

- Arithmetic
- General
- Time Functions
- Hydrologic
- Smoothing
- Statistics

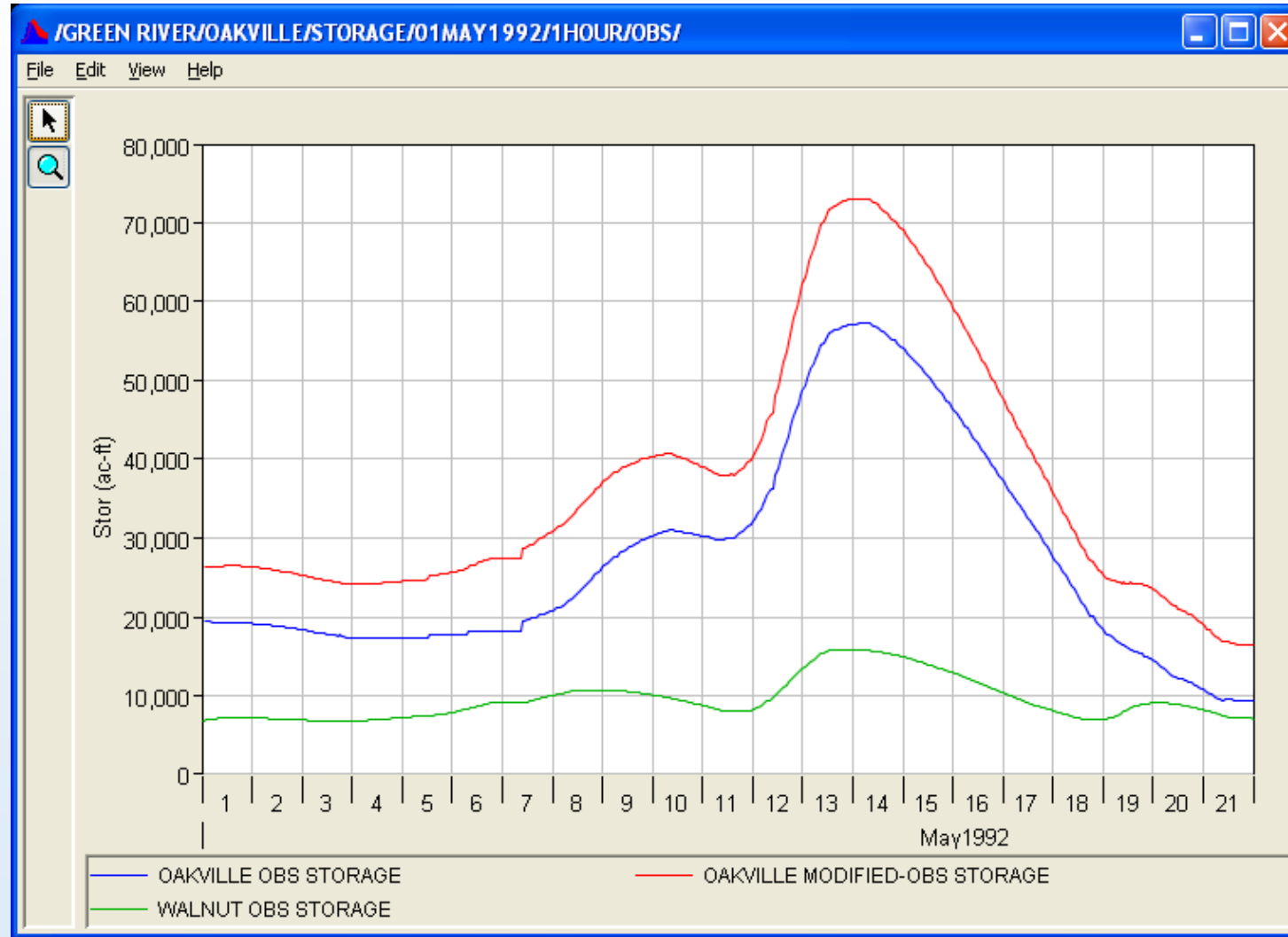


Arithmetic Operations – Part 1

- Add constant, data set
- Subtract constant, data set
- Multiply constant, data set
- Divide constant, data set
- Exponentiation power
- Absolute Value
- Square Root
- Log e
- Log Base 10



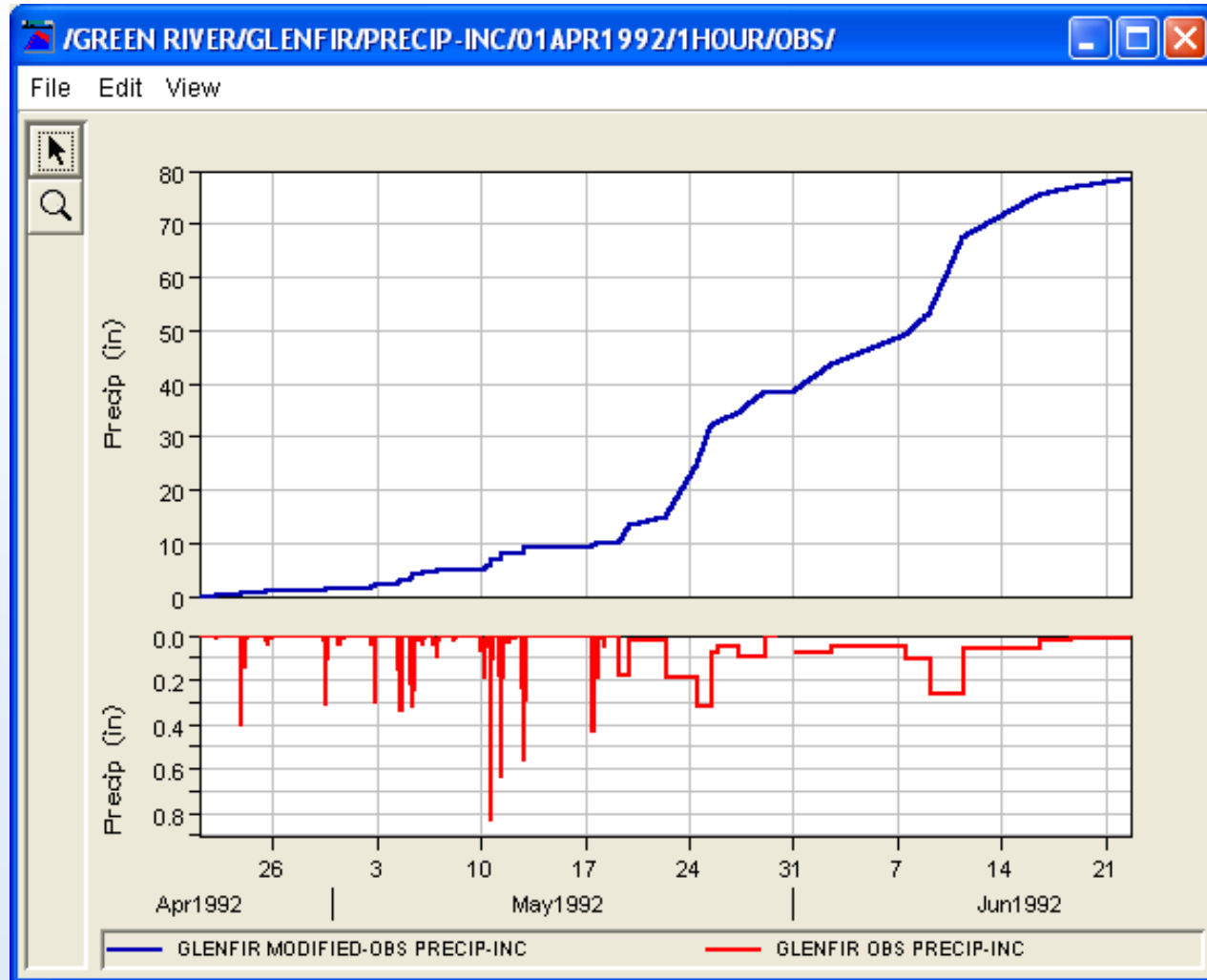
Add Data Sets



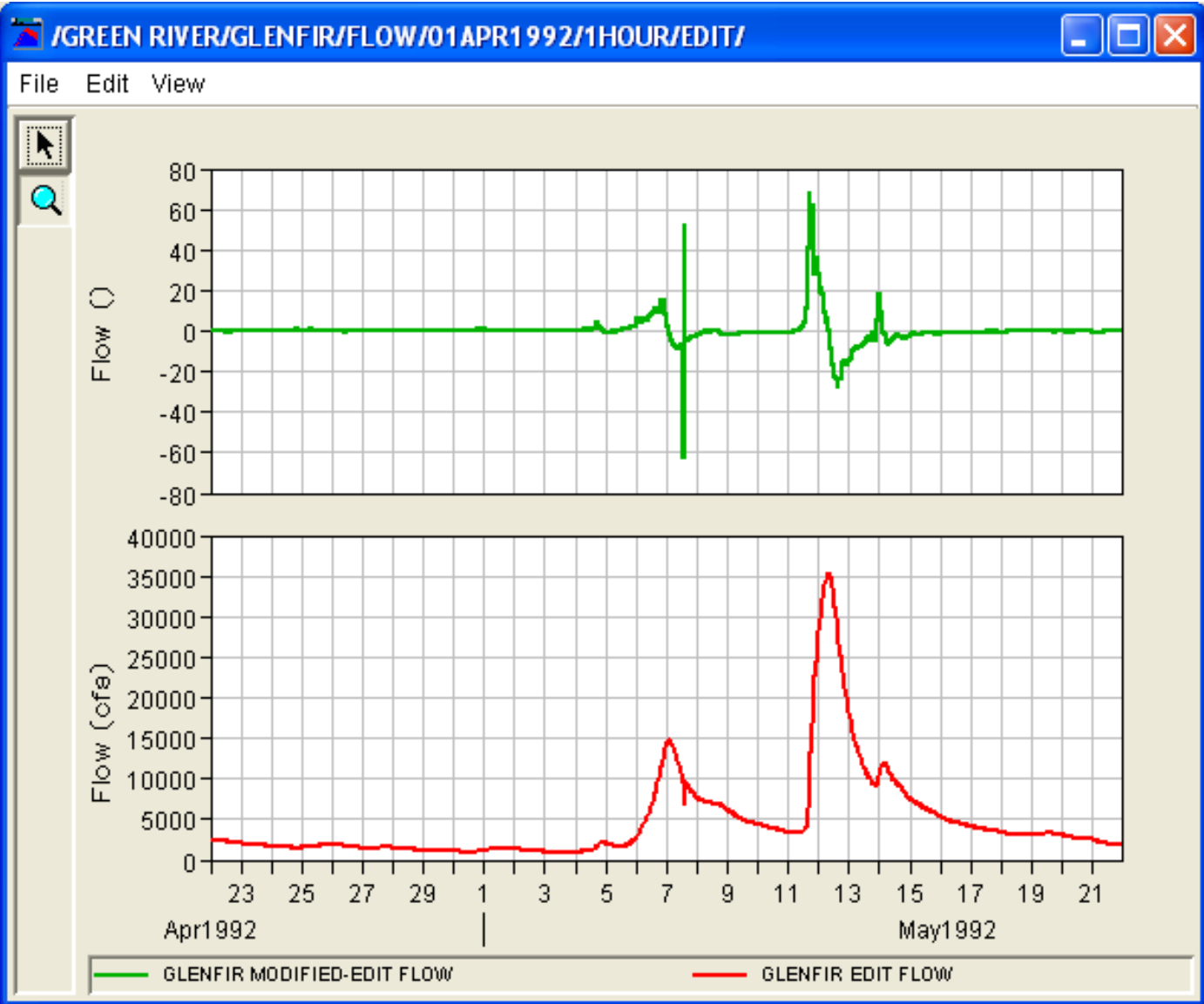
Arithmetic Operations – Part 2

- Sine
- Cosine
- Tangent
- Inverse ($1/x$)
 - $1/0.0$ becomes missing
- Accumulation
 - E.g. incremental precipitation to cumulative
 - Missing values treated as zero
- Successive Differences
 - Difference, regardless of time interval
 - E.g. cumulative precipitation to incremental
- Time Derivative
 - Successive Difference per unit time

Accumulation



Time Derivative



General Functions – Part 1

- Units Conversion
 - Metric (SI) to English
 - English to Metric (SI)
- Set Units
 - Units
 - Conversion multiplier
- Set Type
 - Will not modify the data; only sets the type field
- Round to nearest whole number
- Truncate to whole number

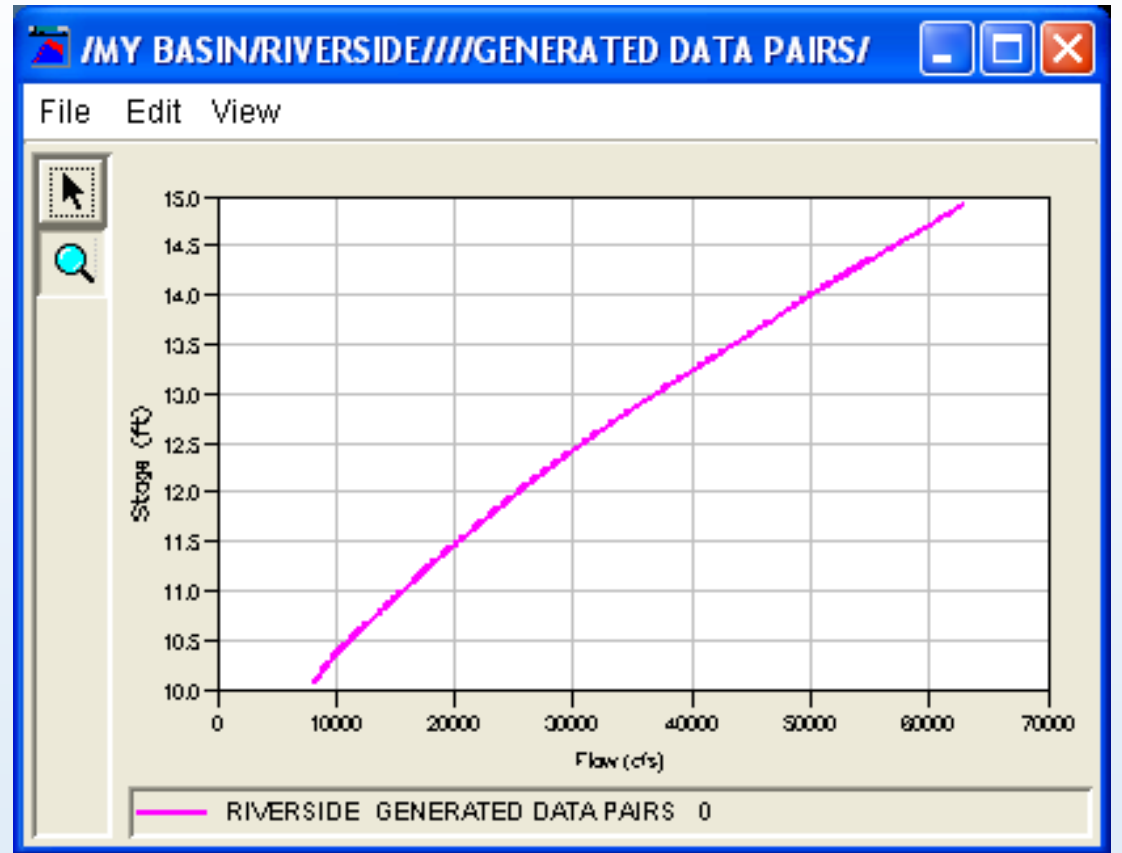
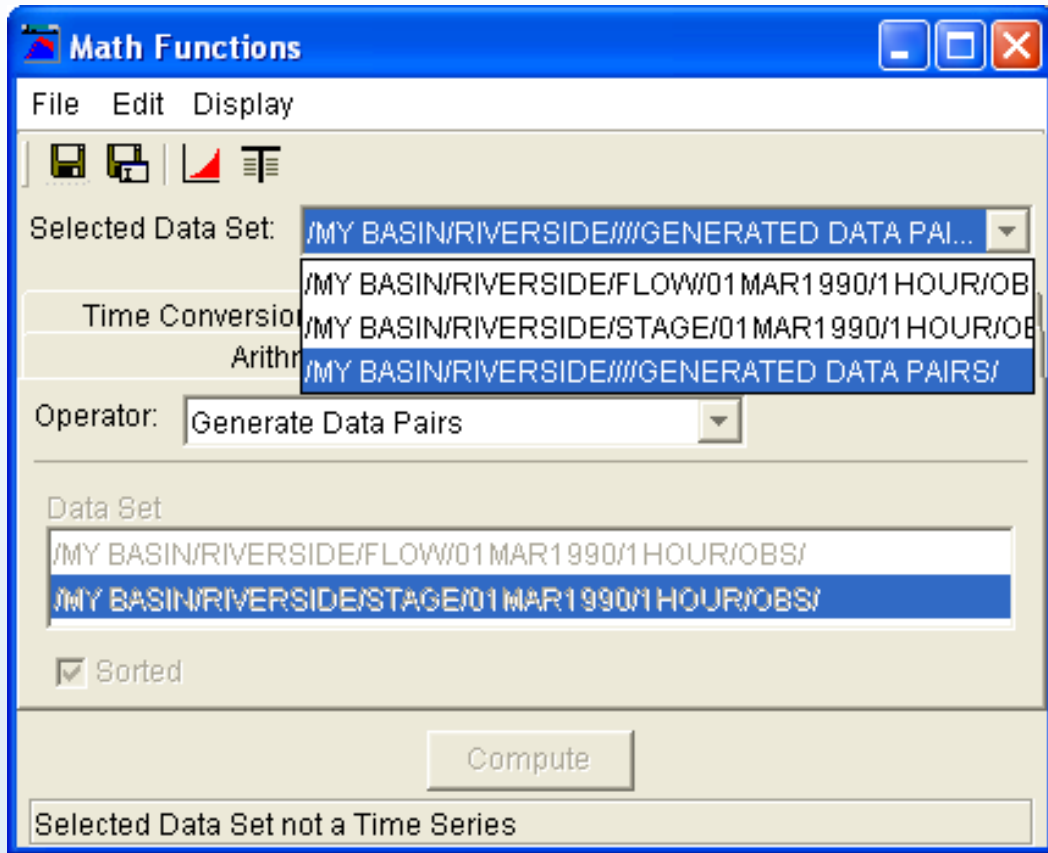
General Functions – Part 2

- Round off
 - To number of significant digits
 - To decimal position (2 means nearest 100, -2 means nearest 0.01)
- Estimate missing values
 - Maximum number of consecutive missing values
 - Interpolate cumulative precipitation
- Replace specific values
- Screen using minimum and maximum
 - Minimum, maximum, and change in values
 - Sets values not passed to missing or flags

General Functions – Part 3

- Screen with forward moving average
 - Compares change to forward moving average
 - Number to average specified by user
- Merge time series
 - Primary and secondary
 - Replace missing values (not average)
- Merge paired data
- Paired Data operations
 - Set the horizontal axis or swap parameters
 - Reorder to ascending and remove duplicate values
 - Resample points
- Generate data pairs
 - E.g., generate a rating table from stage and flow time series data sets

Generate Data Pairs



Math Functions

End of Part 1 . . .

What is your purpose on Earth?

BUOYANT

$$\text{FORCE } \left(\frac{F}{V} \right) = \rho_f \cdot g \cdot \Delta V$$

GRAVITATIONAL

$$\text{FORCE } (S) = mg$$

$$= 5.974 \times 10^{24} \text{ kg}$$
$$= 6374 \text{ km}$$

$$\int V^2 ds \int (\rho g \cos \alpha) ds = \frac{1}{2} \rho g \cos \alpha \int ds$$
$$= \frac{1}{2} \rho g \cos \alpha \cdot L$$

