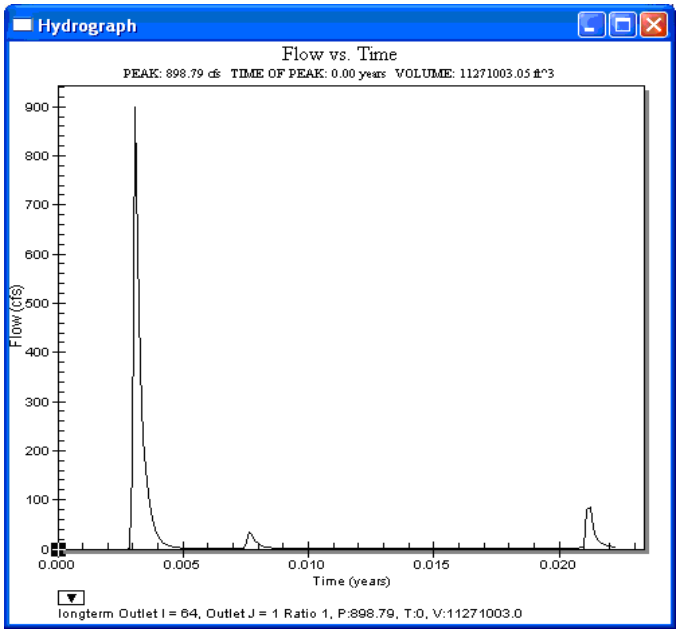
WMS

v. 11.0

WMS 11.0 Tutorial

GSSHA Long-Term Simulations Data Formatting

Formatting data for use in a long-term simulation in GSSHA



Objectives

Learn how to create a precipitation (GAG) file and a hydrometeorological (HMET) file, both of which are required for long-term GSSHA simulations.

Prerequisite Tutorials

- GSSHA – Modeling Basics – Developing a GSSHA Model Using the Hydrologic Modeling Wizard in WMS

Required Components

- Time Series Data Editor application
- GSSHA

Time

- 20-35 minutes

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1 Introduction

This tutorial demonstrates formatting a precipitation file for multiple events, and formatting hydrometeorological (HMET for short) data so the data can be imported into a long-term GSSHA simulation. The Time Series Data Editor application included with WMS will be used in this tutorial.

1.1 Getting Started

The first step is to open the Time Series Data Editor application by doing the following:

1. In Windows, click *Start* and enter "Time Series Editor" in the *Search all programs and files* field.
2. Select "Time Series Editor 3.0" from the list to launch the Time Series Data Editor application.

The editor should appear similar to Figure 1.

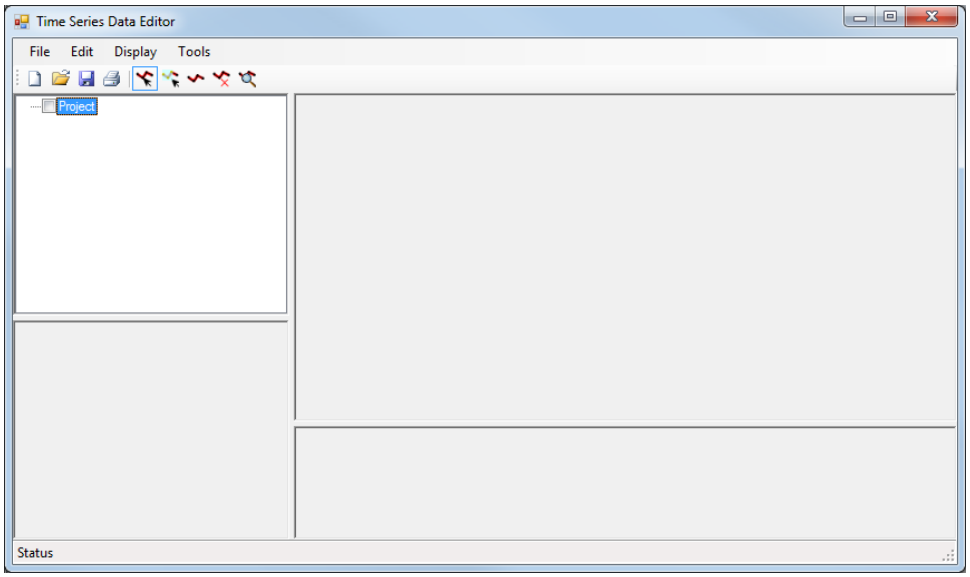

Figure 1 Time Series Data Editor application

2 Precipitation Data

A long-term event typically consists of multiple rainfall events, often with several rain gages. Multiple gage events can be edited using the *Time Series Data Editor*, a convenient tool developed for managing such data.

Precipitation data preparation for GSSHA involves formatting data into columns that include year, month, day, hour, minute, and value information. This information is then saved as a gage (GAG) file.

2.1 Importing Precipitation Data

The raw data generally needs some processing before it can be used in a GAG file. Follow these steps to correctly format the raw data:

1. Select *File* | **Open…** to bring up the *Open* dialog.
2. Browse to the *data files* folder for this tutorial.
3. Select "Precip_raw.txt" and click **Open** to exit the *Open* dialog and bring up the *Import File Wizard* dialog.
4. In the *File Import Options* section, select *Fixed Width*.
5. Enter "3" in the *Start Import at Row* field, and turn off *Heading Row*.

The first three rows of data will be crossed out. This means they will not be imported. The first column will have dates, appearing in YYYYMMDD format, as in "20010823".

6. On the *Read Data* tab at the bottom, on the first non-crossed out row, click between the "2001" and "08" to create a vertical data separation line.

The vertical data separation line should appear similar to the one in Figure 2. Notice the arrow at the top of the vertical line. The arrow at the top of the vertical data separation line points to the Spacing Bar, which has the numbers "0", "10", "20", and so on, from left to right. The vertical lines can be adjusted by moving either the arrow or the line using the mouse. The vertical line and the arrow both turn red when selected (Figure 2).

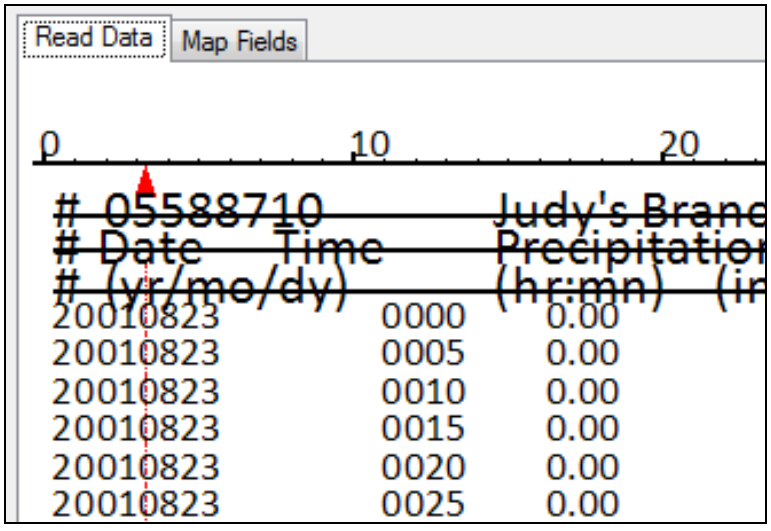

Figure 2 Selected data separation line between year and month

7. Create four additional vertical data separation lines:
    - Between the "08" and "23" in the first column.
    - To the right of the "23" in the first column.
    - Between the "00" and the "00" in the second column.
    - To the right of the second "00" in the second column.

The vertical data separation lines should appear similar to those in Figure 3. This ensures that the year, month, day, hour, minute, and value are in separate columns for the next step.

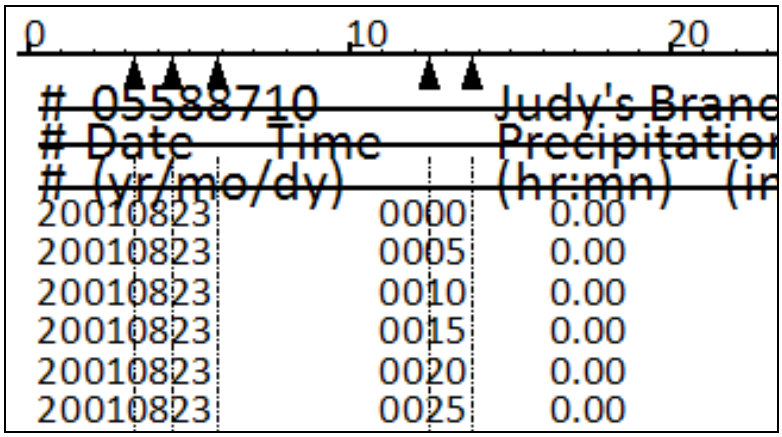

Figure 3 All five data separation lines

8. Adjust the columns as necessary so they match those in the image.
9. Click **Next** to switch to the *Map Fields* tab.
10. Enter "Precipitation" in the first field in the *Time Series List* section.
11. In the lower spreadsheet section, verify that the data is properly separated into the columns. If they are not separated properly, click the *Back* button and modify the vertical data separation lines before returning to the *Map Fields* tab.
12. In the top spreadsheet section, on the *Mapping Values* row, select the correct value for that column based on the following table:

Column	Mapping Data
Column 0	Year
Column 1	Month
Column 2	Day
Column 3	Hour
Column 4	Minute
Column 5	Value

13. In the *Value* column, on the *Units* row, enter "in" to indicate the units are in inches.
14. In the Value column, on the Names row, enter "Gage 1".

The values should appear as in Figure 4.

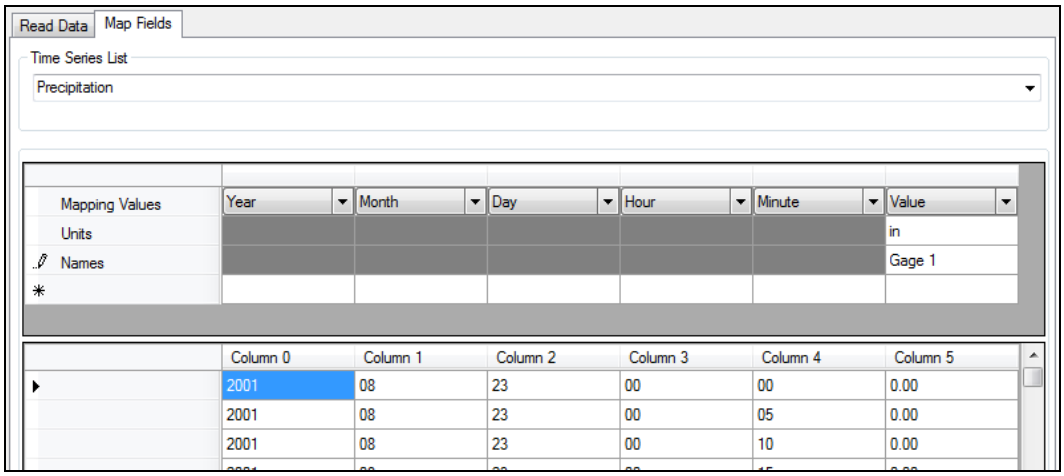

Figure 4 Map Fields tab

15. Click **OK** to close the *Import File Wizard* dialog.

The graphics window should appear similar to Figure 5. Notice the spikes of activity around the 24th, 26th, and 31st. These indicate storms.

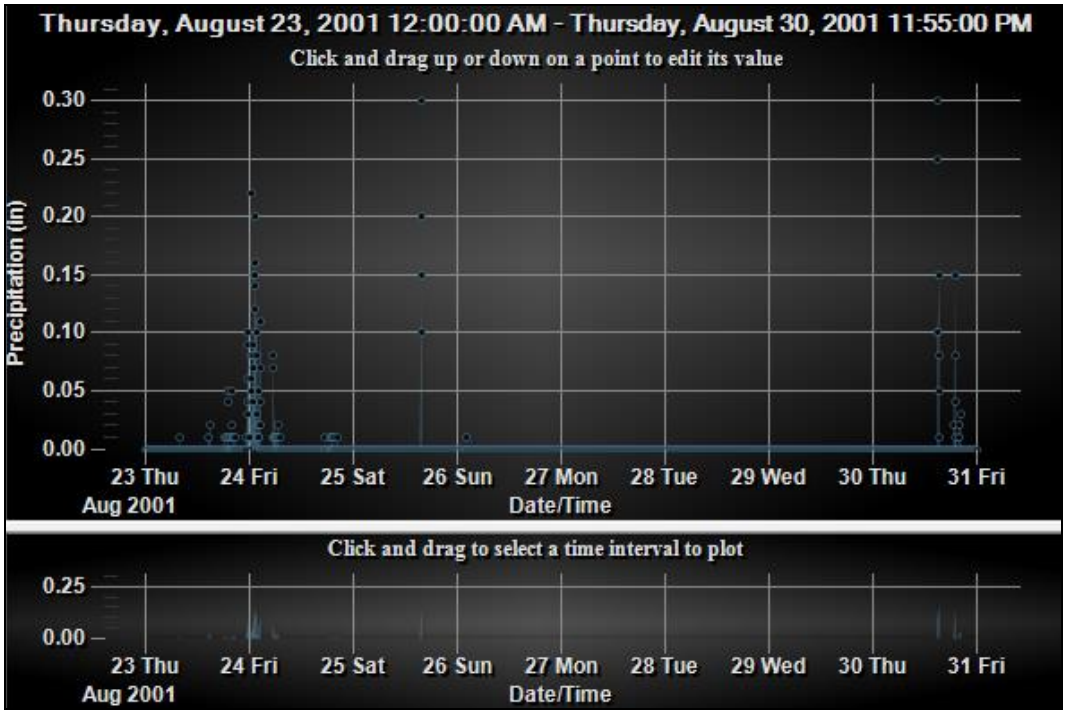

Figure 5 Three separate storms

2.2 Editing the Time Series Data

The imported data is a record of precipitation over about a week's time. From this data, exclude the times when there was no rainfall for a considerable duration. In other words, isolate the storms into separate events.

1. In the Project Explorer, select "Gage 1".
2. Select *Edit* | **Properties…** to bring up the *Time Series Properties* dialog.

3. In the *Properties* section, enter "4294413" as the *Latitude* and "243038" as the *Longitude*.
4. In the *Series Type* section, select *Incremental*.

Feel free to review the values (*Number of points*, *Minimum Value*, *Maximum Value*, and *Mean*) at the bottom of the dialog.

5. Click **OK** to close the *Time Series Properties* dialog.
6. Select *Tools* | **Split Time Series for GSSHA** to bring up the *TimeSeriesSplitterGSSHA* dialog.
7. In the *Time Interval (Min)* section, enter "720".

This is equivalent to 12 hours. This is the duration of no rainfall used as a criterion to separate the storms into individual events. This means that if there is a 12-hour period of no precipitation, the storm is considered to have ended.

8. In the *Select Time Series* section, select "Gage 1" and click **Add** to move it to the Selected Time Series section.
9. Click Generate to close the Time Series Properties dialog.

There should now be three GSSHA events listed in the Project Explorer. These events are individual storms at least 12 hours apart.

2.3 Exporting the Gage File

Now export the data as a gage file to be used in GSSHA.

1. Select *File* | **Save As…** to bring up the *Save As* dialog.
2. Select "GSSHA Gage (*.gag)" from the *Save as type* drop-down.
3. Enter "precipitation.gag" as the *File name* and click **Save** to exit the *Save As* dialog and bring up the *GSSHA File Generator* dialog.
4. Turn on *Convert inch to mm.*

This converts the precipitation data to millimeters. GSSHA requires the precipitation data to be input as millimeters.

5. In the *Select Time Series List* section, turn on all three GSSHA Events.
6. Click **OK** to close the *GSSHA File Generator* dialog.

This data is now formatted properly and ready to use in GSSHA. The "precipitation.gag" file can be imported into a GSSHA simulation. For more details on doing this, please see the "GSSHA Long-Term Simulations" tutorial.

3 Hydrometeorological Data

Hydrometeorological data are used in GSSHA to determine how the soil moisture is affected by atmospheric conditions. The hydrometeorological data is used to drive the evapotranspiration model which is particularly important during the time between events when it is not raining. In the following steps, create a file that contains all the hydrometeorological data for the same period as the precipitation data.

3.1 Exporting the Data

First, start with a clean slate:

1. Select *File* | **New** to bring up the *New/Delete All* dialog.
2. Click **No** to close the *New/Delete All* dialog without saving the existing data. It will not be needed for this part of the tutorial.
3. Outside of the Time Series Data Editor, open a spreadsheet application.
4. In the spreadsheet application, open the "Hmet_raw.xls" file from the *data files* folder for this tutorial.

Notice that there are two sheets in this spreadsheet file: "KBLV_Scott" and "scott_radiation_2001". GSSHA needs the following hydrometeorological information from the data in this spreadsheet:

Date	in "YYYYMMDD" format, Example: "20010823" is August 23, 2001
Hour	in "????z" format, Example: "0100z" is 1:00 AM Zulu time, the z stands for Zulu, and is needed
Barometric Pressure	in decimal value with inches as the unit, Example: "29.92"
Relative humidity	in percent value, Example: "54"
Sky Cover	in 8ths of the sky that is covered, Example: "0" means no clouds, "4" is halfway covered, and "8" is completely overcast
Wind Speed	in knots, with direction and unit label, Example: "21006KT" is wind from 210 degrees at 6 knots
Temperature	in degrees Celsius, Example: "32" is 32 degrees Celsius
Direct Radiation	W h m^{-2}
Global Radiation	W h m^{-2}

The barometric pressure, relative humidity, sky cover, and wind speed are on the "KBLV_Scott" sheet, and the two radiation parameters are on the "scott_radiation_2001" sheet. Because the two sets of data have different time scales (though for the same length of time), import these data individually into the Time Series Data Editor application. If the data had the same start/finish time and same temporal resolution (same time steps or time scales), then the data could be imported at the same time.

5. In the spreadsheet application, save a copy of the spreadsheet by selecting *File* | **Save As…** and naming the copy "Hmet_raz_copy.xls",
6. On the first sheet ("KBLV_Scott"), delete all of the columns except for the following seven:
    - Date
    - Time
    - Wind
    - Sky (8ths)
    - Temp (C)
    - RH%
    - Altimeter (inches)
7. Select *File* | **Save As…** to bring up the *Save As* dialog.

8. Select "Text (Tab delimited) (*.txt)" from the *Save as type* drop-down.
9. Enter "Input1.txt" as the *File name* and click **Save** to close the *Save As* dialog.
10. If advised the file format doesn't support multiple sheets, click **OK**.
11. Click **Yes** when asked to keep the format and leave out any incompatible features.
12. Switch to the "scott_radiation_2001" sheet.
13. Delete all of the columns except for the following six:
    - year
    - mo
    - day
    - hr (Z)
    - direct rad
    - total global rad
14. Select *File* | **Save As…** to bring up the *Save As* dialog.
15. Select "Text (Tab delimited) (*.txt)" from the *Save as type* drop-down.
16. Enter "Input2.txt" as the *File name* and click **Save** to close the *Save As* dialog.
17. If advised the file format doesn't support multiple sheets, click **OK**.
18. Click **Yes** when asked to keep the format and leave out any incompatible features.
19. Close the spreadsheet program, clicking **No** when asked to save changes.

The input files are now ready to be prepared by the Times Series Data Editor application.

3.2 Importing the Base Hydrometeorological Data

With the desired data saved as tab-delimited text files, the Time Series Data Editor application can now be used to prepare the data to be used by GSSHA.

1. Go back to the *Time Series Data Editor* application.
2. Select *File* | **Open…** to bring up the *Open* dialog.
3. Select "Input1.txt" and click **Open** to exit the *Open* dialog and bring up the *Import File Wizard* dialog.
4. In the *File Import Options* section, select *Fixed Width*.
5. Enter "1" in the *Start Import at Row* field.

This removes the heading row.

6. Create eleven vertical data separation lines as shown in Figure 6.

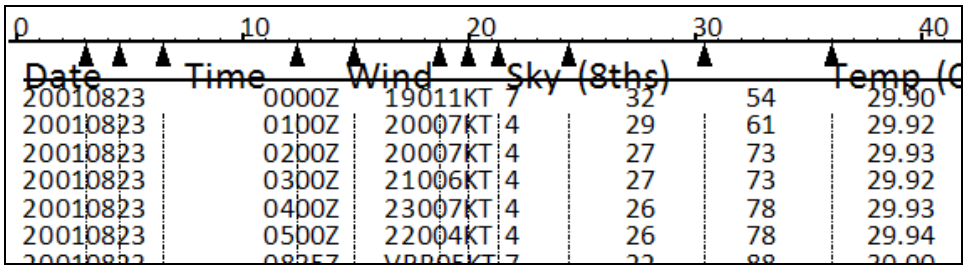

Figure 6 Eleven vertical data separation lines

7. Click **Next** to switch to the *Map Fields* tab.
8. In the *Time Series List* section, enter "HMET".
9. Using the column names in the lower spreadsheet section, use the table below to select the appropriate option from the drop-down on the *Mapping Data* row in the upper spreadsheet section.

Note that not all columns will be edited.

10. Use the table below to enter the *Names* for columns 6 and 8-11:

Column	Mapping Data	Field Names
Column 0	Year	
Column 1	Month	
Column 2	Day	
Column 3	Hour	
Column 6	Value	Wind Speed
Column 8	Value	Sky Cover
Column 9	Value	Temperature
Column 10	Value	Relative Humidity
Column 11	Value	Pressure

11. Click **OK** to close the *File Import Wizard* dialog.

The graphics window should appear similar to Figure 7.

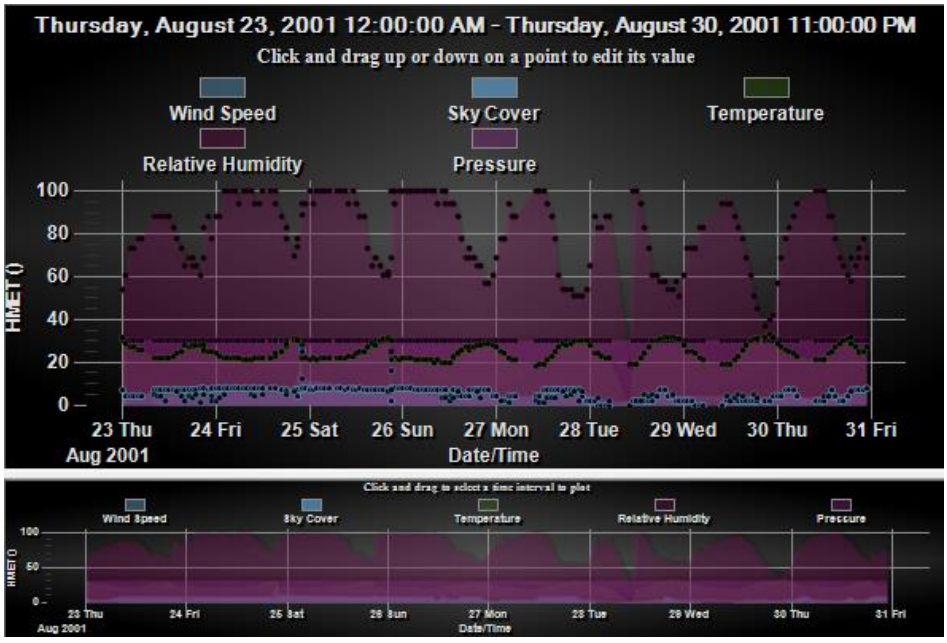

Figure 7 Various imported data

3.3 Importing the Radiation Data

The radiation data can now be imported:

1. Select *File* | **Open…** to bring up the *Open* dialog.
2. Select "Input2.txt" and click **Open** to exit the *Open* dialog and bring up the *Import File Wizard* dialog.

All the fields are already split correctly by default, so do not separate any columns.

3. Enter "1" in the *Start Import at Row* field.
4. Click **Next** to switch to the *Map Fields* tab.
5. In the *Time Series List* section, select "HMET" from the drop-down.
6. Using the table below, select the correct *Mapping Values* from the drop-down in each indicated column, and enter the *Names* for the indicated columns.
7. When done, click **OK** to close the *Import File Wizard* dialog.

Column	Mapping Data	Field Name
Column 1	Year	
Column 2	Month	
Column 3	Day	
Column 4	Hour	
Column 5	Value	Direct Radiation
Column 6	Value	Global Radiation

Notice that the data from second input file has been added to the same time series. The project should appear similar to Figure 8.

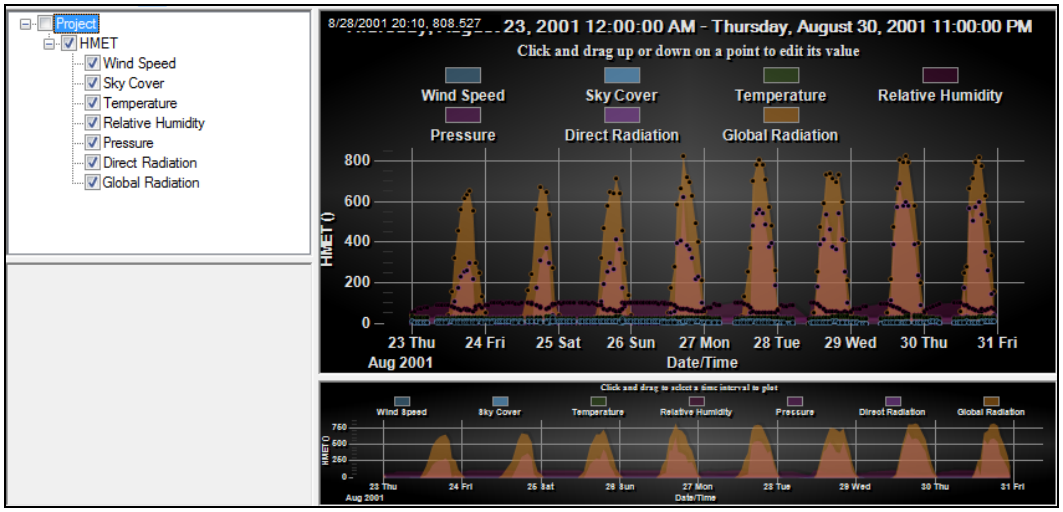

Figure 8 Project with all data imported

4 Exporting the Data to GSSHA

The data is now ready to export as GSSHA HMET data.

1. Select *File* | **Save As…** to bring up the *Save As* dialog
2. Select "HMET (*hmt)" from the *Save as type* drop-down.

3. Enter "hmet.hmt" as the *File name*.
4. Click **Save** to close the *Save As* dialog and bring up the *HMET* dialog.
5. Turn on *Convert Temperature from Celsius to Fahrenheit*.

If the temperature data is already in Fahrenheit, do not turn on this option.

6. Verify that the *Time Series* names match the *Mapping Parameter* in the spreadsheet at the bottom. They should appear as in Figure 9.
7. When done, click **Save** to close the *HMET* dialog.
8. Close the *Time Series Data Editor* application.

The HMET file is now ready to be used in a GSSHA simulation.

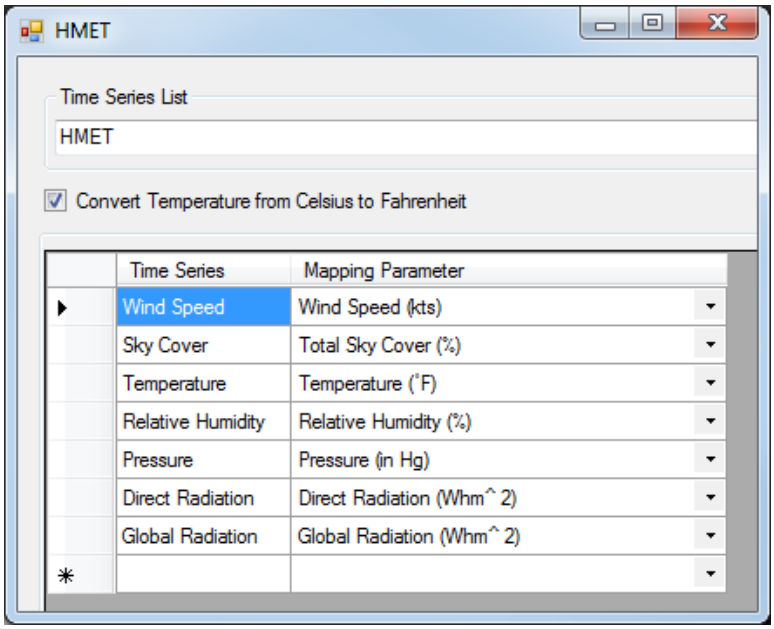

Figure 9 HMET dialog

5 Conclusion

This concludes the "GSSHA Long-Term Simulations Data Formatting" tutorial. Feel free to continue to experiment, or exit the program.