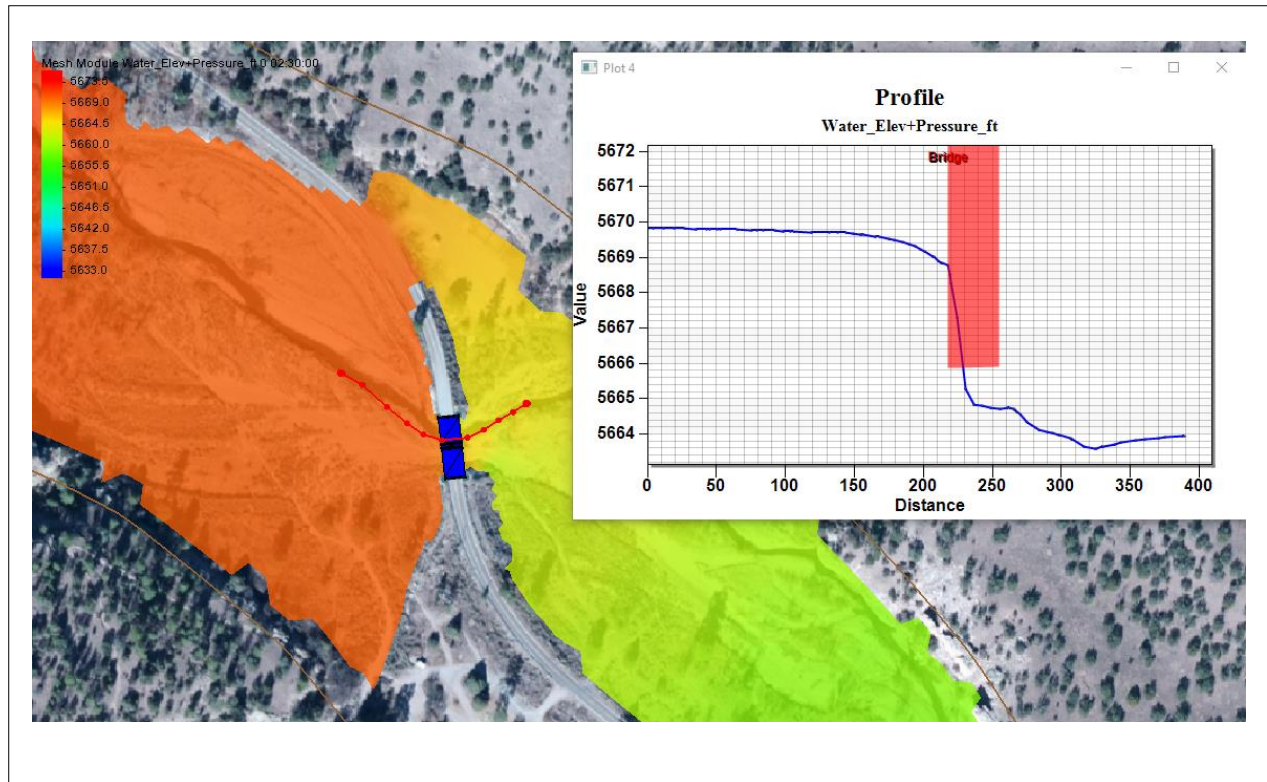


SMS 13.1 Tutorial

Dataset Toolbox



Objectives

This tutorial will demonstrate many of the tools inside of the *Dataset Toolbox*.

Prerequisites

- Size Function
- SRH-2D Post Processing

Requirements

- Scatter Set Module
- Mesh Module
- SRH-2D

Time

- 20–30 minutes

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1	Introduction	2
2	Opening the Starting Project	2
3	Using the Math Tools	3
3.1	Compare Datasets.....	3
4	Using the Spatial Tools	4
5	Using the Temporal Tools	4
5.1	Sample Time Steps.....	5
5.2	Compute Derivatives.....	5
5.3	Merge Dataset	5
6	Using the Conversion Tools	6
6.1	Vector to Scalar.....	6
7	Using the Coastal Tools	6
8	Using the Modification Tools	7
8.1	Filter	7
8.2	Map Activity	7
9	Conclusion.....	8

1 Introduction

The *Dataset Toolbox* in SMS contains several tools for generating new datasets from existing data.

Other tutorials demonstrate some of the *Dataset Toolbox* capabilities. These include the “Creating a Size Function” and “Creating a Wavelength Based Mesh” tutorials. Other tutorials have demonstrated using the *Data Calculator* tool of the *Dataset Toolbox*. This tutorial will cover tools in the *Dataset Toolbox* outside of the Data Calculator, Spatial, and Coastal tools.

This tutorial will use a previously developed SRH-2D simulation using a mesh generated from data gathered in a portion of the Cimarron River in Oklahoma. .

2 Opening the Starting Project

To open the simulation and solution data:

1. Select *File / Open...* to bring up the *Open* dialog.
2. Select “Project Files (*.sms)” from the *Files of type* drop-down.
3. Browse to the *data files* folder for this tutorial and select “Gila_Sim.sms”.
4. Click **Open** to import the project and exit the *Open* dialog.
5. If asked to delete existing data, click **Yes**.
6. Click on the different datasets under the mesh and scroll through the time steps.

The project should appear similar to Figure 1.

The project contains a mesh with solution datasets for two different model runs. These solutions datasets will be modified using the tools in the *Dataset Toolbox*. The simulations used for the solutions sets have been included in case further exploration of the model is warranted.

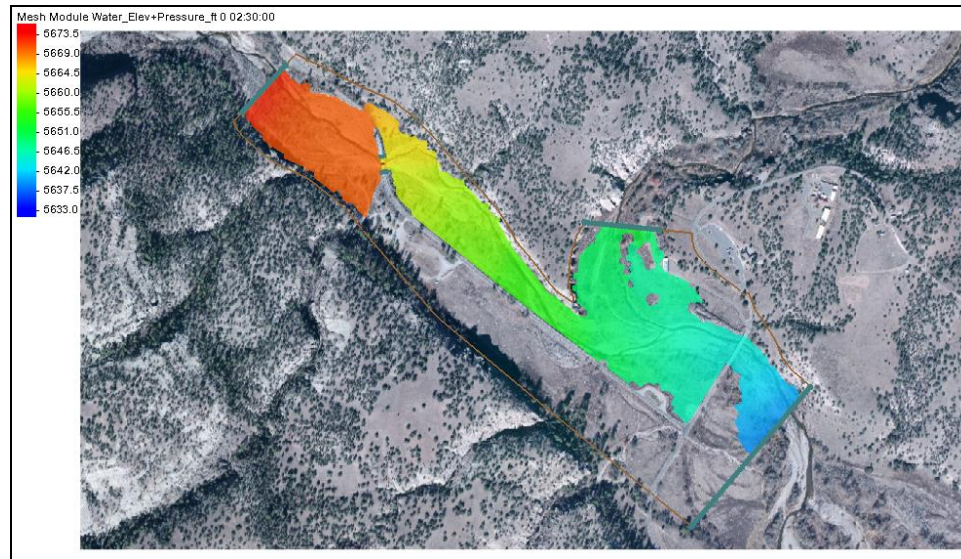


Figure 1 Initial project showing the water elevation dataset.

3 Using the Math Tools

The *Math* tools in the *Dataset Toolbox* are more general in purpose than some of the other tools.






The *Math* tools contain the *Data Calculator* which allows performing mathematical operations on scalar datasets. A wide range of calculations can be performed using the *Data Calculator*. A number of tutorials cover using the *Data Calculator* so it will not be shown in this tutorial. Refer to the *Data Calculator* article on the xmswiki.com for more information.


The *Angle Convention* tool is used to create a new dataset with a different angle convention from a scalar dataset containing direction is a given convention. It will be demonstrated in a future tutorial that explores using the Coastal tools.

The *Compare Datasets* tool is used to show a comparison between two datasets.

3.1 Compare Datasets

The *Compare Datasets* tool subtracts one dataset, the “alternate”, from a base dataset in order to create a new dataset. To use this tool, do the following:

1. In the Project Explorer, select “ Gila_Mesh” to make it active.
2. Select *Data* | **Dataset Toolbox** to open the *Dataset Toolbox* dialog.
3. In the *Tools* section, select *Compare Datasets*.
4. For the *Base* section of the tool, select the “ Water_Elev+Pressure_ft” dataset under the “ Regular Flow” folder.
5. For the *Alternate* section of the tool, select the “ Water_Elev+Pressure_ft” dataset under the “ Modified Flow” folder.

6. Leave the *Value if Base is Inactive* and *Value if Alternate is Inactive* at “99.0”. This will put a null value in inactive areas of the mesh. When a value is entered here, inactive areas will have that value.
7. For the *Output Dataset Name*, enter “Elev+Presure_Compared”.
8. Click **Compute**.
9. Click **Done** to close the *Dataset Toolbox* dialog.
10. Select the “ Elev+Pressure_Compared” dataset and scroll through the *Time Steps*.

Notice that the datasets show the areas where the two compared datasets match up.

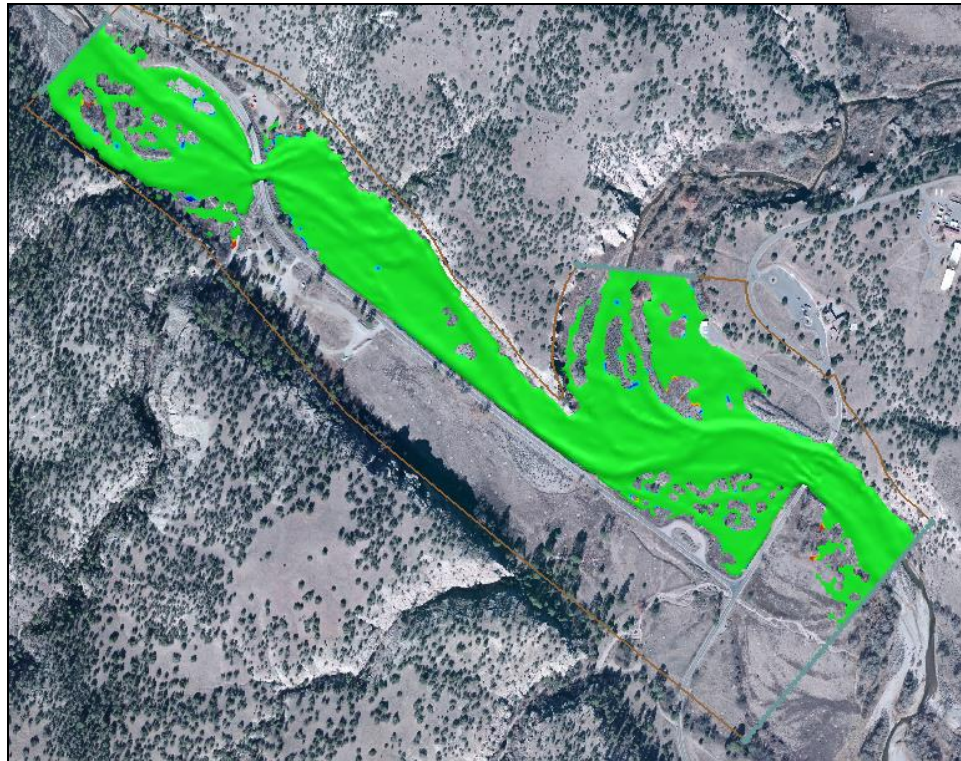


Figure 2 Final time step in the compared dataset

4 Using the Spatial Tools





The spatial tools can be used to create size functions based off of depth, slope, or curvature. See the “Creating a Size Function” tutorial for more information about these tools.

5 Using the Temporal Tools

The temporal tools allow adjusting time steps for a transient dataset.





5.1 Sample Time Steps

A dataset can be created from an existing dataset that samples the time steps to change the number of time steps. The number of time steps can either be increased or decreased within the starting and ending time steps of the initial dataset. To do this:

1. In the Project Explorer, select “ Gila_Mesh” to make it active.
2. Select *Data* | **Dataset Toolbox** to open the *Dataset Toolbox* dialog.
3. In the *Tools* section, select *Sample Time Steps*.
4. Under *Datasets*, select the “ Water_Depth_ft” dataset under the “ Modified Flow” folder.
5. In the *Time Steps* section, select “00:005:00” then click on **Set As Start**.
6. Also in the *Time Steps* section, select “02:00:00” then click on **Set As End**.
7. In the *Sampling Options* section, change the *Time Step* to be “15” and “minutes”.
8. Leave *Interpolate Times* as checked on.
9. For the *Output Dataset Name*, enter “Water_Depth_ft_15min”.
10. Click **Sample** to create the new dataset.
11. Click **Done** to close the *Dataset Toolbox*.
12. Select the “ Water_Depth_ft_15min” dataset and scroll through the *Time Steps*.

5.2 Compute Derivatives





The *Compute Derivatives* tool can be used to find the areas of greatest change.

1. In the Project Explorer, select “ Gila_Mesh” to make it active.
2. Select *Data* | **Dataset Toolbox** to open the *Dataset Toolbox* dialog.
3. In the *Tools* section, select *Compute Derivative*.
4. Under *Datasets*, select the “ B_Stress_lb_p_ft2” dataset under the “ Modified Flow” folder.
5. In the *Options* section, select the *Change* option.
6. For the *Output Dataset Name*, enter “Stress_Change”.
7. Click **Sample** to create the new dataset.
8. Click **Done** to close the *Dataset Toolbox*.
9. Select the “ Stress_Change” dataset and scroll through the *Time Steps*.

5.3 Merge Dataset

Two transient datasets can be merged using the *Merge Dataset* tool. When using this tool, the datasets should not have time steps that overlap. The dataset created from using this tool will contain all the time steps from both transient datasets. Therefore, this tool can be used to append multiple simulation runs together.

This example will use two datasets that were previously generated. To use the Merge Dataset tool, do the following:

1. In the Project Explorer, select “ Gila_Mesh” to make it active.
2. Select *Data* | **Dataset Toolbox** to open the *Dataset Toolbox* dialog.
3. In the *Tools* section, select *Merge Datasets*.
4. Under *Dataset One*, select the “ Elevation_hour1” dataset.
5. Under *Dataset Two*, select the “ Elevation_hour2” dataset.
6. For the *Output Dataset Name*, enter “Elevation_merged”.
7. Click **Compute** to create the new dataset.
8. Click **Done** to close the *Dataset Toolbox*
9. Select the “ Elevation_merged” dataset and scroll through the *Time Steps*.



6 Using the Conversion Tools

The conversion tools allowed converting datasets into either a scalar or vector dataset.

6.1 Vector to Scalar

Converting a vector dataset to a scalar dataset allows creating multiple datasets. This allows closer examination of one aspect of the vector data, such as the x vector or y vector.

To convert a vector dataset to a scalar dataset, do the following:

1. In the Project Explorer, select “ Gila_Mesh” to make it active.
2. Select *Data* | **Dataset Toolbox** to open the *Dataset Toolbox* dialog.
3. In the *Tools* section, select “Vector to Scalar”.
4. Under *Datasets*, select the “Velocity” dataset under the “Modified Flow” folder.
5. In the *Options* section, select the *Vx* and *VY* options.
6. For the *Output Dataset Name*, enter “Gila_Velocity”.
7. Click **Compute** to create the new datasets.
8. Click **Done** to close the *Datset Toolbox* dialog.
9. Select the “ Gila_Velocity Vx” dataset and scroll through the *Time Steps*.

7 Using the Coastal Tools



The dataset toolbox contains several tools for creating and modifying dataset for use in coastal models. The “Wavelength Based Mesh” tutorial gives an example of using two of these tools. These tools will be discussed in a future tutorial.

8 Using the Modification Tools

The Modification tools allow creating datasets that modify an existing dataset based on certain criteria.

8.1 Filter


The Filter tool creates a new dataset based on selected filtering criteria. :


1. In the Project Explorer, select “ Gila_Mesh” to make it active.
2. Select *Data* | **Dataset Toolbox** to open the *Dataset Toolbox* dialog.
3. In the *Tools* section, select “Filter”.
4. Under *Datasets*, select the “Vel_Mag_ft_ps” dataset under the “Modified Flow” folder.
5. In the *Filters* section, change *If* to “<=” and enter “6.0” next to it.
6. Check the box under *If*.
7. Leave the field that “and” and change the field under that to “>=” and enter “2.0” next to it.
8. Click the **Add** button.
9. For the *Output Dataset Name*, enter “Vel_Mag_filtered”.
10. Click **Compute**.
11. Click **OK** to close the *Data Options* dialog.
12. Select the “ Vel_Mag_filtered” dataset and scroll through the *Time Steps*

A warning will appear say that a similar water elevation dataset will be used since it could not find the same water elevation dataset.

8.2 Map Activity

The Map Activity tool maps the activity from one dataset to a second dataset. It helps show only the values of interest on a particular dataset.

1. In the Project Explorer, select “ Gila_Mesh” to make it active.
2. Select *Data* | **Dataset Toolbox** to open the *Dataset Toolbox* dialog.
3. In the *Tools* section, select “Map Activity”.
4. Under *Value Dataset*, select the “Water_Depth_ft” dataset under the “Modified Flow” folder.
5. Under *Activity Dataset*, select the “Vel_Mag_filtered” dataset under the “Modified Flow” folder.
6. For the *Output Dataset Name*, enter “Vel_Mag_mapped_Depth”.
7. Click **Map** to create the dataset.
8. Click **OK** to close the *Data Options* dialog.

9. Select the “ Vel_Mag_mapped_Depth” dataset and scroll through the *Time Steps*.

9 Conclusion

This concludes the “Dataset Toolbox” tutorial. Feel free to continue experimenting with the Dataset Toolbox, or exit SMS.