A. DATA FILES

Data may be up to three-dimensional and have to be coded into plain ASCII files. No special formatting is necessary, yet they must observe the following structure:

- The first record is intended to be a header to identify the data. It is often automatically used to label the output.
- The second record must be the number of fields per data entry.
- Starting with the third record, there should be one record per attribute containing a short description. A logical choice is to provide attribute type and unit of measurement, if any.

DATA FILES

- If the file has *v* attributes, the numerical values for the sample start at record *v* + 3, one for each site, under the following restrictions:
  - The entries must be strictly numeric. No letters or special symbols are allowed.
  - There must be exactly as many columns as indicated in the second record. A special code chosen by the user, such as -999, should be used if there are missing values.
  - It is required to provide at least two Cartesian coordinates specifying location.
- The number of records is unlimited.

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EXAMPLE OF DATA FILE

UNCF unconformity
4
Identification
Easting, m
Northing, m
Depth, ft

1	32000	87015	7888
2	38600	87030	8020
3	44000	86400	7949
⋮			
6200	85050	87000	8003
6202	49400	84000	8032

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DATA LOADING

Simply:

- Drag the file icon into the object area of the main menu

or:

- Click on <Objects>.
- Click on <Load Object> at new menu.
- Search for the file of interest.
- Highlight file name and click on <OK>.

The top of the file will be displayed. Finish by:

- Choosing <Point Type> at <Select object type>.
- Clicking on <Next>.

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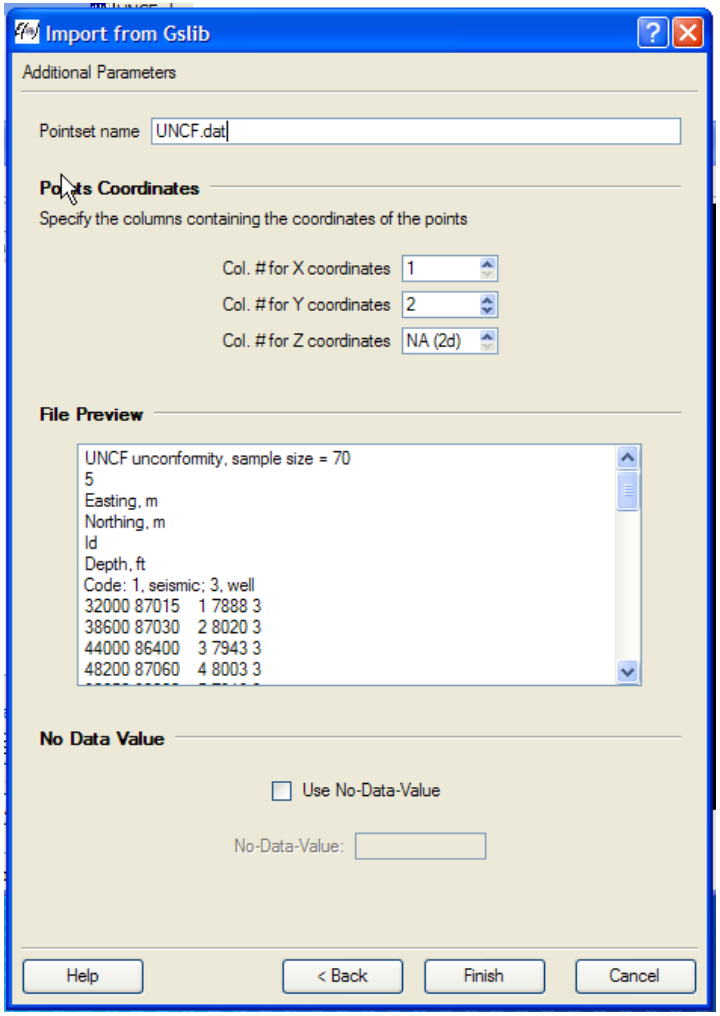
1. COMPLETING DATA LOADING



- Type an object name at <Pointset name>.
- Indicate columns for easting and northing and also depth in three-dimensional studies.
- Specify missing data code, if any.
- Click on <Finish>.

The loading has been completed and the data file will show in the object panel of the main menu.

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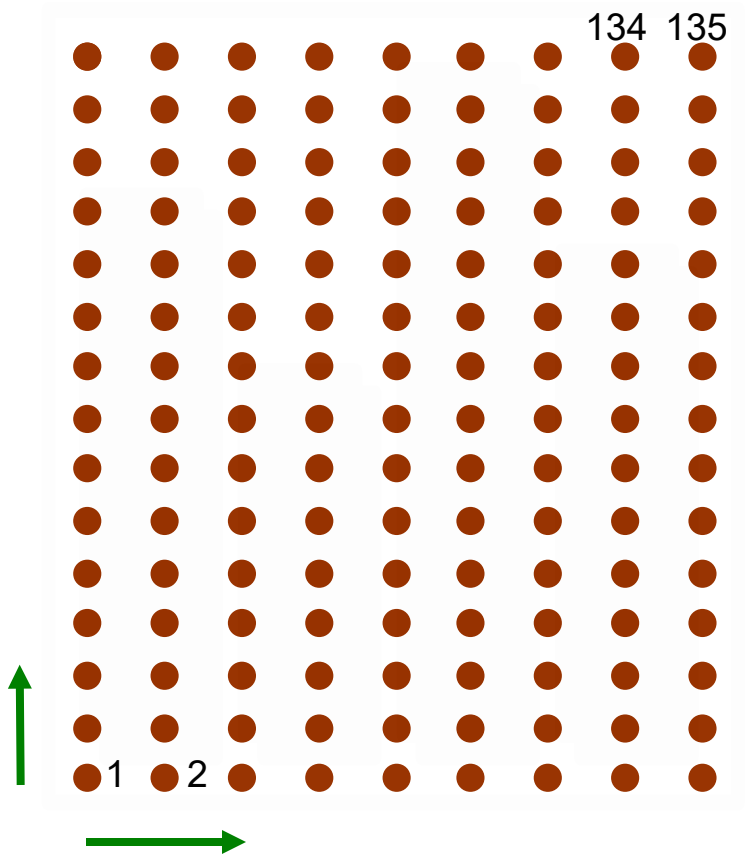
B. GRID LAYOUT



Results from modeling of spatial attributes come in the form of arrays of values at regular intervals.

Coordinates for the nodes are not printed; they are implicit in the regular arrangement.

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IMPLICIT ARRANGEMENT

- In three-dimensional modeling, layer values go from the lowermost layer to the uppermost layer.
- Within a layer, the first value to go into the file is the one in the lower left corner.
- Then come the rest of the values for the lowermost row, from left to right.
- Within a layer, last value to enter the file is the one in the extreme upper right corner.
- Specification of grid geometry goes into a separate file.

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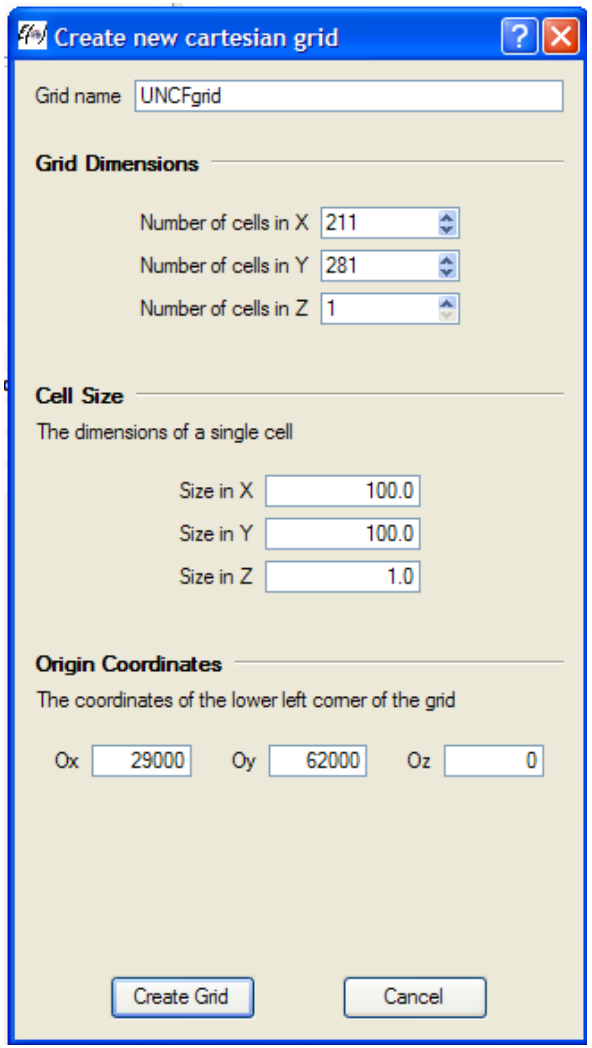
GRID SPECIFICATION FILE



Remember that grids must be specified before attempting any processing that will result in the generation of a grid, such as estimation or simulation.

For specifying a grid, click <Object> and then select <New Cartesian Grid>.

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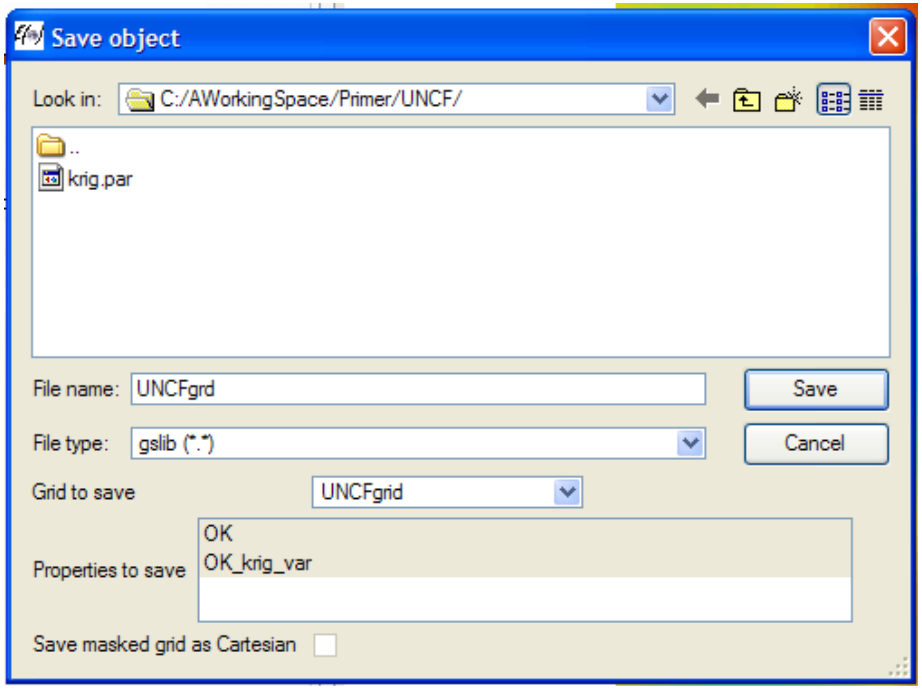
EXAMPLE OF GRID

To minimize storage space, SGeMS stores grid values in binary form. Grids can only be displayed in graphical form.

Numerical display of a grid requires saving it in ASCII format and further viewing it with a text editor. To do such saving:

- Click on <Object>.
- Select <Save Object>.
- Name the file.
- Select place for storage at <Look in>.
- Make sure to select GSLIB as the format.
- Click on <Save>.



VIEW OF GRID WITH TEXT EDITOR

```
UNCFgrid (211x281x1)
2
OK
OK_krig_var
7773.04   2075.6
7766.52   1902.38
7763.12   1745.86
7759.76   1595.19
7756.46   1450.97
          ⋮
8017.93   2229.09
8018.47   2313.04
8018.98   2404.05
8019.46   2501.91
8019.92   2606.35
```

SGeMS automatically creates the first record, which includes the number of columns, rows, and layers.

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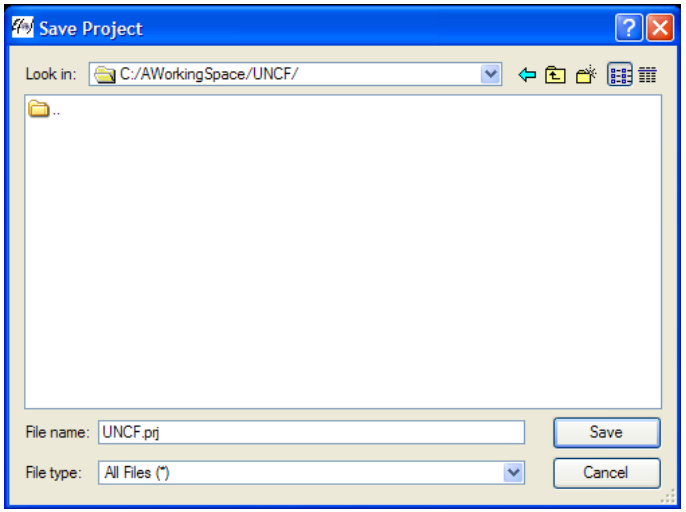
OBJECT SAVE

In SGeMS, all objects in a session make up a project.

The user can save all objects in a project for archiving or further use.



To do that:

- Click on <File> at the upper right corner of the SGeMS screen;
- Click on <Save Project>. This is all that it is necessary to do for an existing project.
- If the project is new, navigate directories to locate a storage folder, select name for the project file, and click on <Save>.

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HISTOGRAM PREPARATION

As a first practical application of SGeMS, let us prepare a histogram of the object previously loaded. For that:

- Click on <Data Analysis> at main menu.
- In the new menu, click on <Histogram>.
- Select the object.
- Choose the property.
- Set the number of classes.
- If there is a need to change the axis extreme values, click on <Display Option> and enter the settings.

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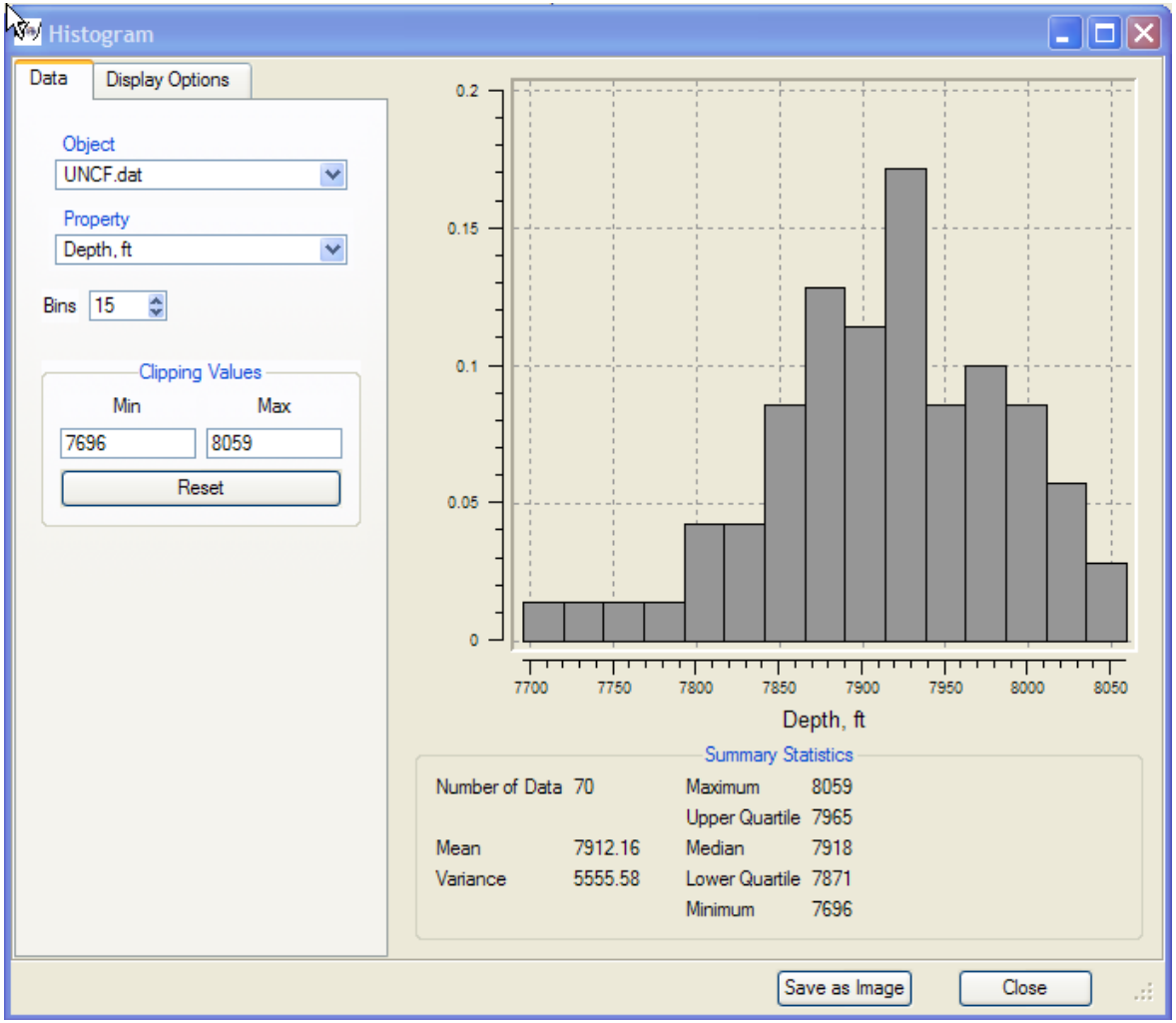
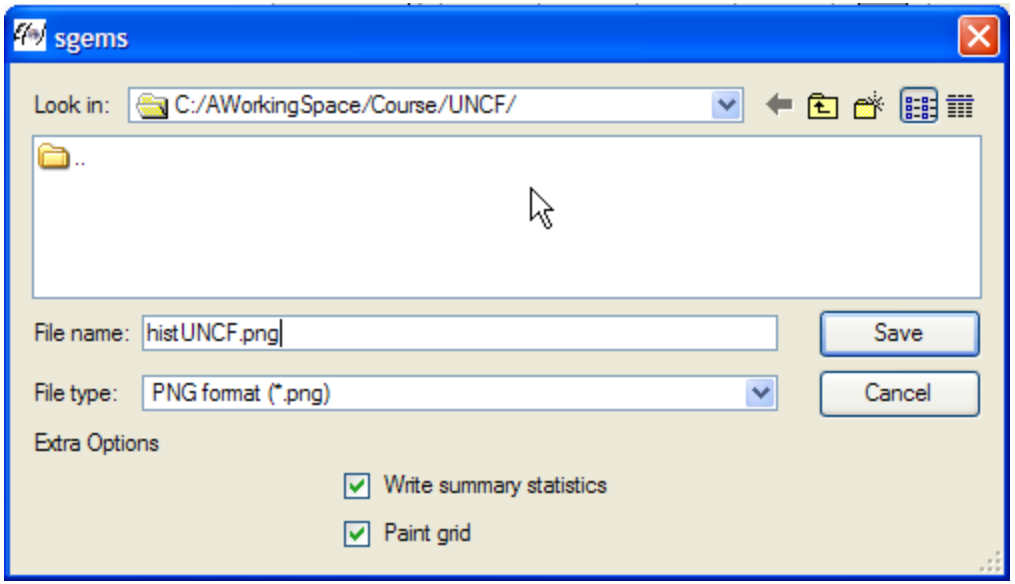
HISTOGRAM DISPLAY



SAVING IMAGE

- Click on <Save as Image>.
- Select a folder.
- Give a name to the file.
- Select type.
- Decide on grid and summary statistics.
- Click on <Save>.



The histogram graphical file is now at the specified folder.

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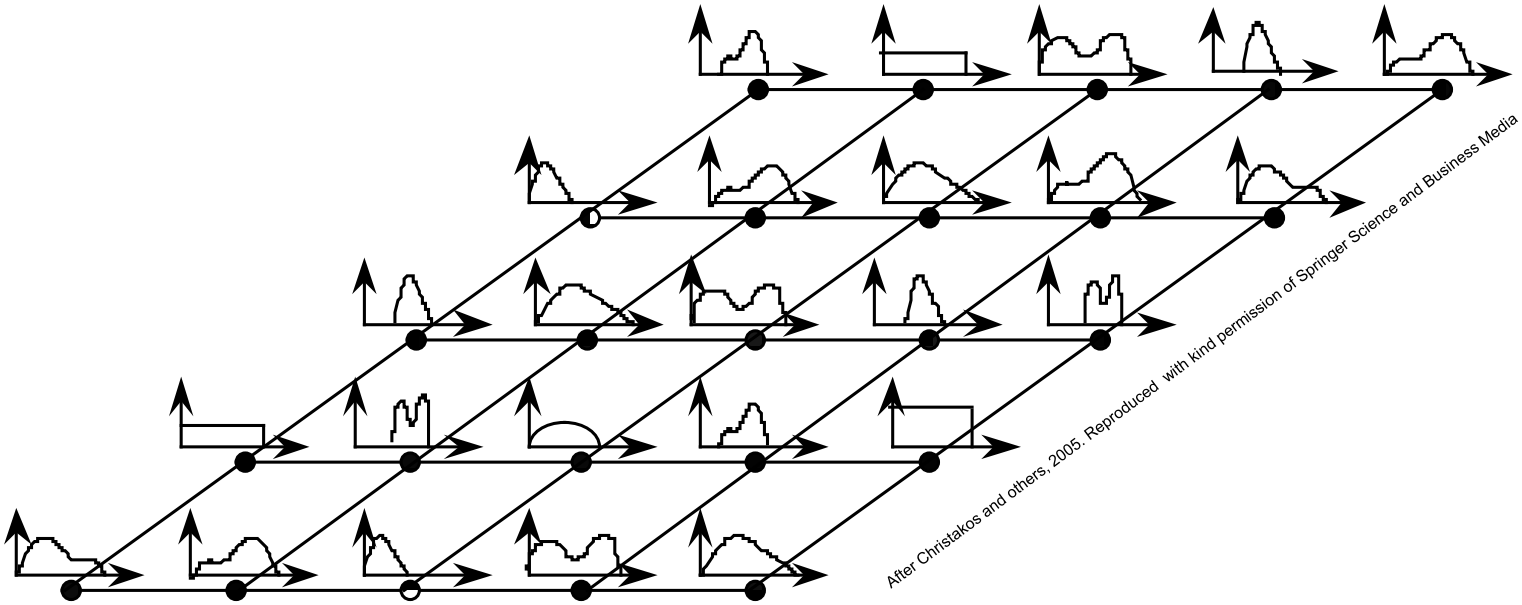
5. SPATIAL STATISTICS

RANDOM FUNCTIONS



A random function is a collection of random variables, one per site of interest in the sampling space.

A realization is the set of values that arises after obtaining one outcome for every distribution.

Geostatistics relies heavily on random functions to model uncertainty.

MAIN DIFFERENCES BETWEEN CLASSICAL GEOSTATISTICS AND CLASSICAL STATISTICS

- Geographical location is an integral part of any sample.
- Measurements have an associated volume called support. For example, in the case of density, the support is the specimen volume; a depth measurement has a point support.
- Geostatistics does not assume that the variables are independent and identically distributed.
- A spatial sample is regarded as a single realization of a random function, instead of multiple outcomes of a single random variable.
- Most geostatistical formulations do not require any particular probability distribution, although some work better under normality conditions.
- The most efficient forms of spatial sampling are those following a regular pattern—cubic or hexagonal, for example.

ERGODIC ASSUMPTION

We have seen that stochastic methods regard data as one of an infinite number of possible realizations.

Ordinarily, one needs multiple realizations to infer properties of the complete ensemble.

The ergodic assumption basically states that just one realization is indeed sufficient to make reliable assessments about ensemble properties.

It is an assumption because it is not possible to test it.