4 Survery-4.5 Manage

4.5.8 Manage Horizons

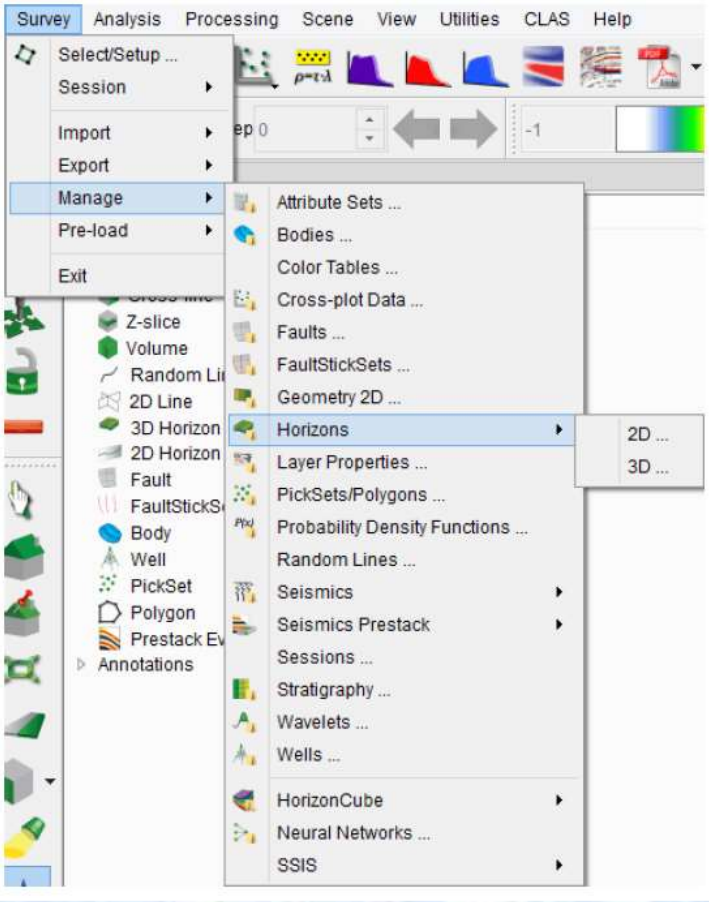
4.5.9 Manage Layer Properties

4.5.10 Manage Pointsets & Polygons

4.5.11 Manage Probability Density Functions

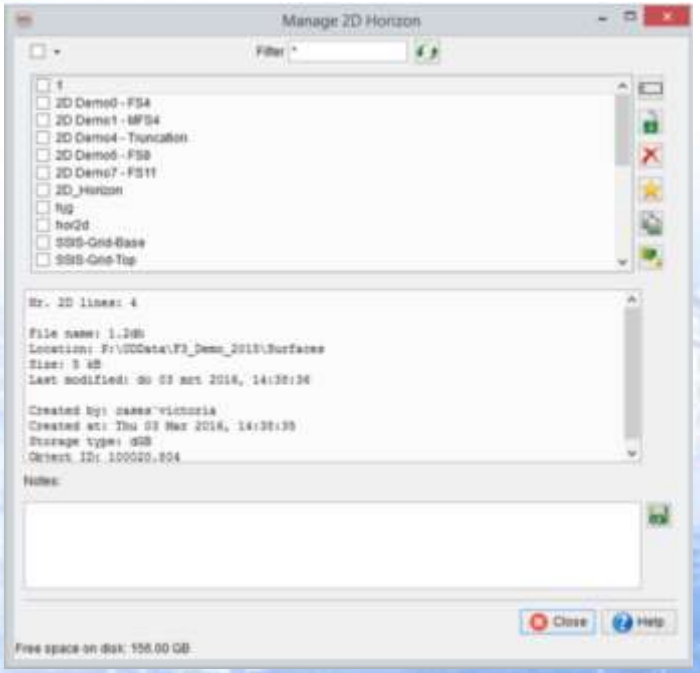
4.5.8 Manage Horizons

Manage either 2D or 3D horizons either via *Survey* > *Manage* > *Horizons*... or via the icon.



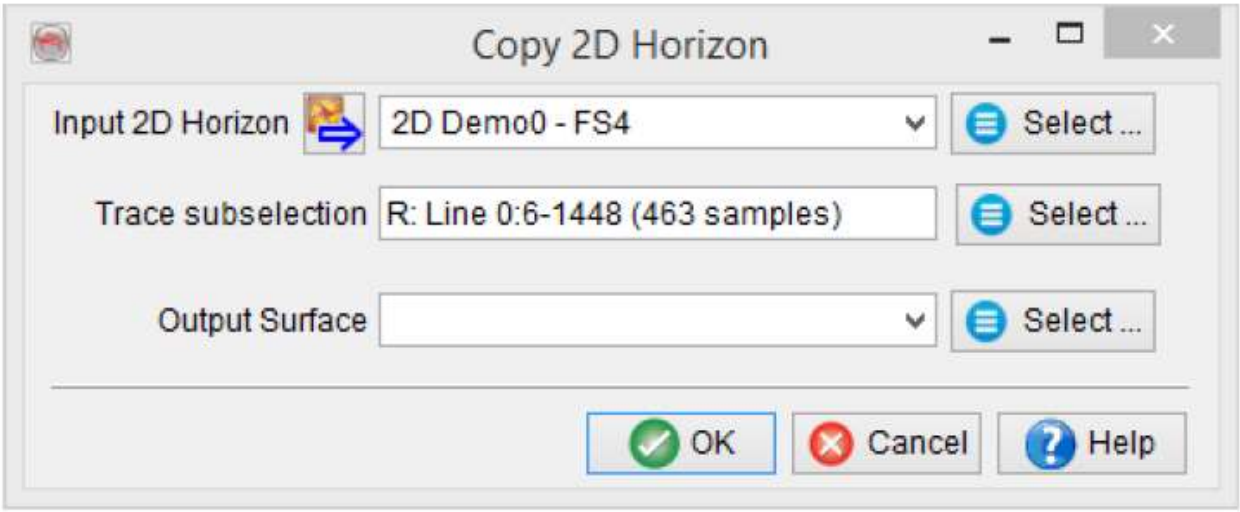
4.5.8.1 Horizon Manager 2D

To open the *Manage 2D Horizons* window, navigate through *Survey*--> *Manage*--> *Horizons*--> *2D*... or use the icon from the Manage toolbar. In the left panel of the window, the available horizons are displayed. It the bottom panel, information on the selected horizon is displayed (eg. location on disk, date last modified). At the base of the window the available disk space is noted.



Horizons can be *renamed*, *locked*, *removed*, *copied*, *set as default* or *viewed as a dataset group*.

The following window is used to copy horizon surfaces and grids:



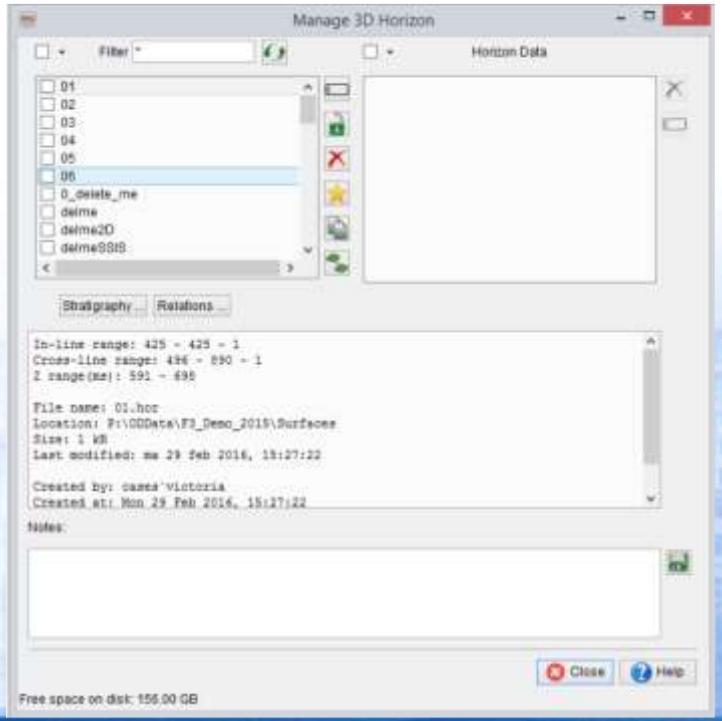
The top filter is used to filter-out the objects with selected names. For instance, to display all horizons that start with letter D use "D*".

4.5.8.2 Horizon Manager 3D

The 3D Horizons manager can be accessed by the menu Survey > Manage > Horizons > 3D or by the quick access icon > 3D Horizons.

This manager (see below) allows to have an overview of the interpreted/imported 3D horizons in the current OpendTect project (left panel), with their associated Horizon Data (right panel). In the bottom panel, information on the selected horizon are displayed (eg. location on disk, date last modified).

Additionally, the available disk space is indicated.

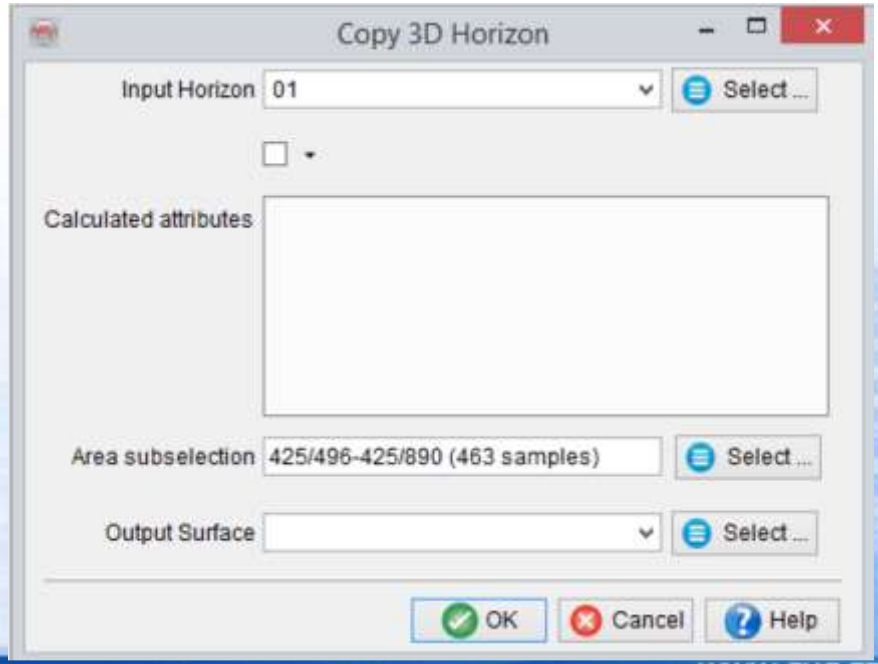


Use the top filter to find the wanted element(s) by typing the name or a part of the name (complete the name with *): for example, to find 'Demo 2 --> FS6', you can type *FS6*.

The basic icons similar to the one from the general selection window are available for the horizons management with some additional actions (see below).

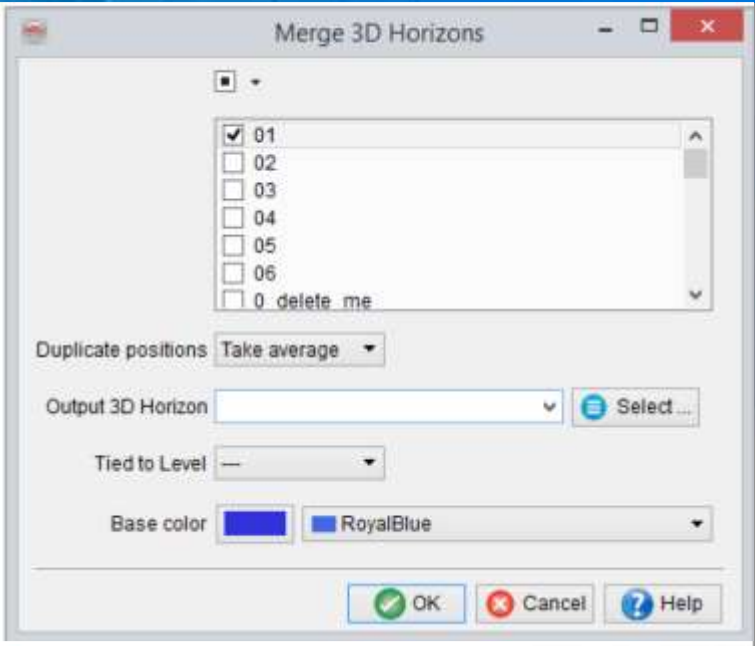
Copy 3D Horizon

The copy window for 3D horizons differs slightly from the usual copy window. It is indeed used to copy surface data and grids.



Merge 3D Horizons

合并

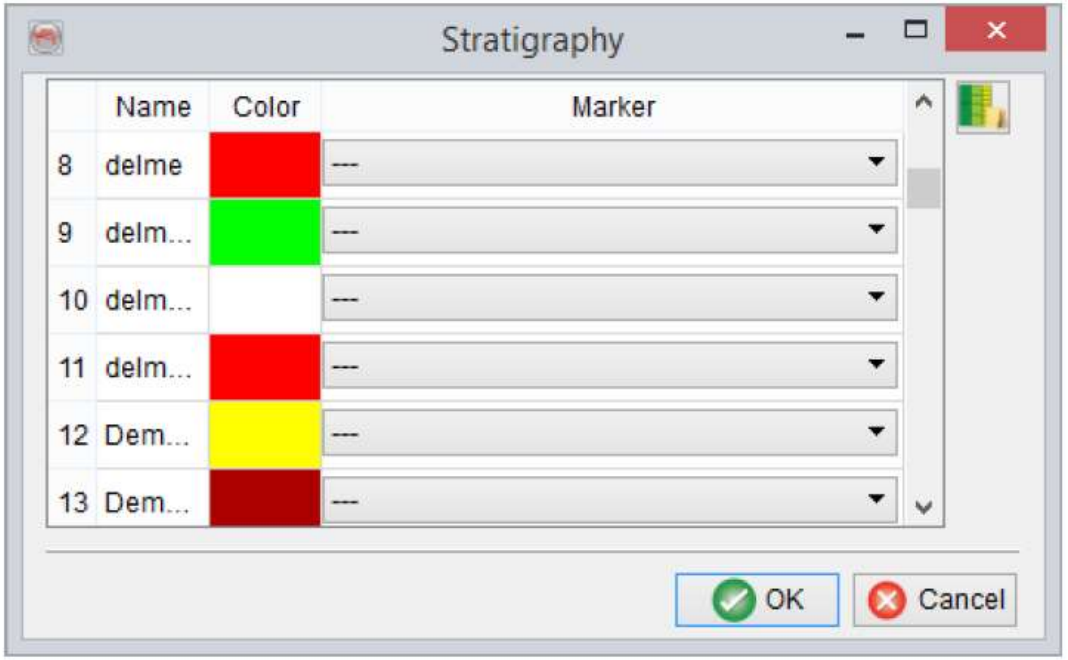


To merge horizons, select the horizons to be merged. In case of duplicate position, the action needs to be specified: take average, use top or use base. The duplicate positions will then be handled in the following manner (dashed line portion represents removed data after merge):

Stratigraphy

地层：将层位绑定到一个level，即一个marker

The horizons can optionally be tied to a level, i.e. a regional marker (see below) by clicking on the Stratigraphy button.



方便后面的合成地震记录操作

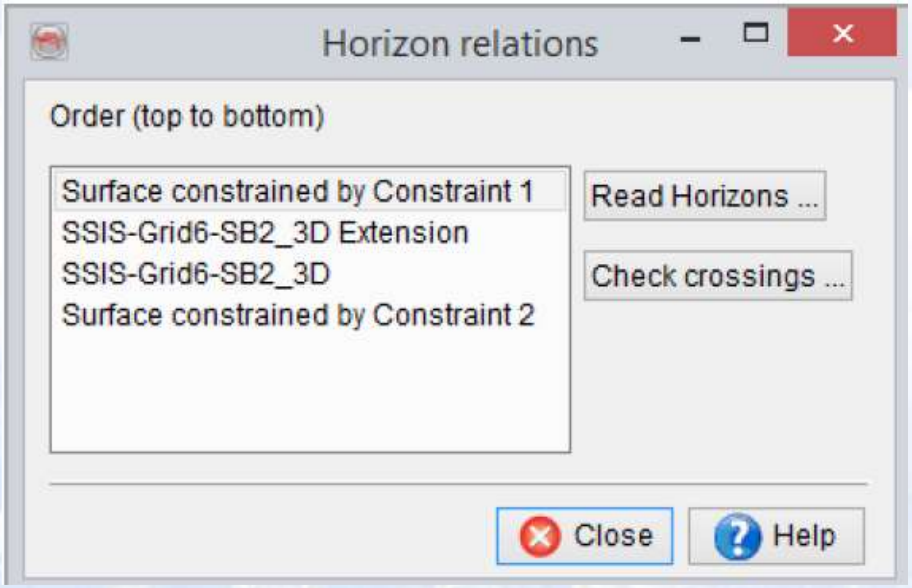
Stratigraphic marker can be assigned to one or more horizons. The horizons will get the marker color, this will facilitate for example the well to seismic tie.

For more details on how to define stratigraphic markers and the subsequent units go to Manage Stratigraphy.

管理地层

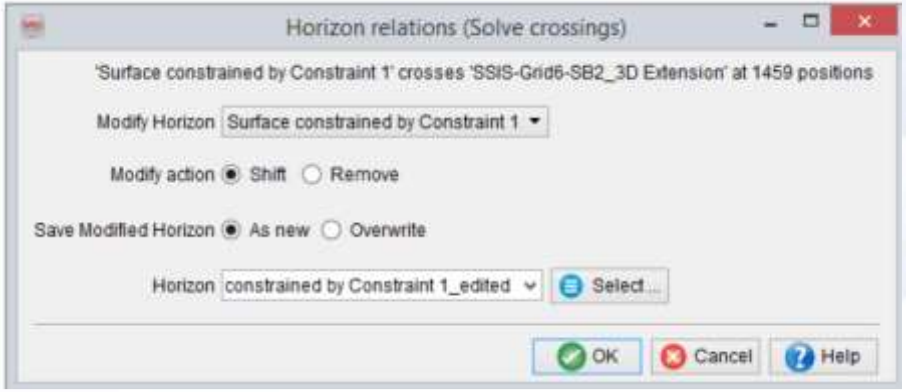
Relations 层位关系

The Horizon relation window is used to resolve conflicts between horizons crossing each other. Read Horizons .... is used to select all horizons that need checking. The horizons are then sorted automatically from top to bottom. The Check crossings... button is used to automatically check the crossings between the listed horizons and resolve them.



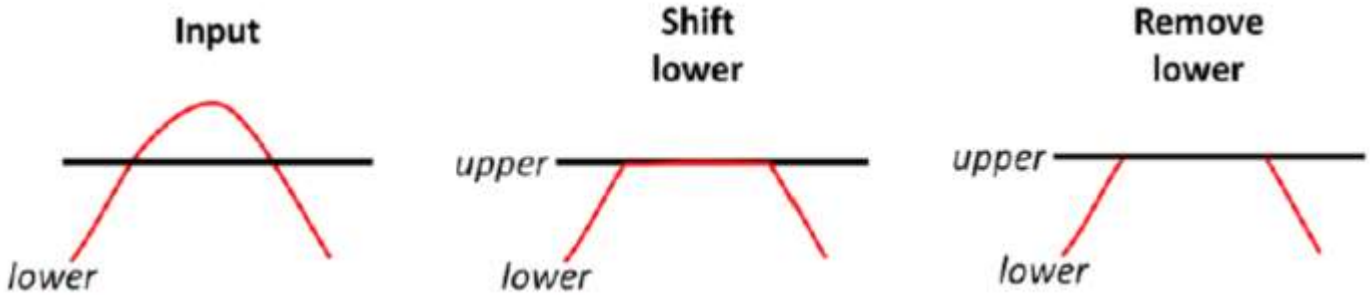
Solving crossing conflicts

To solve crossing conflicts select the horizon that will be modified. The software will check the number of positions where a conflict exits and modify the horizon by removing the conflict points or by changing the values to be equal to the overlying/underlying horizon. In the example below, the checked horizons have been found to cross in 9 positions.

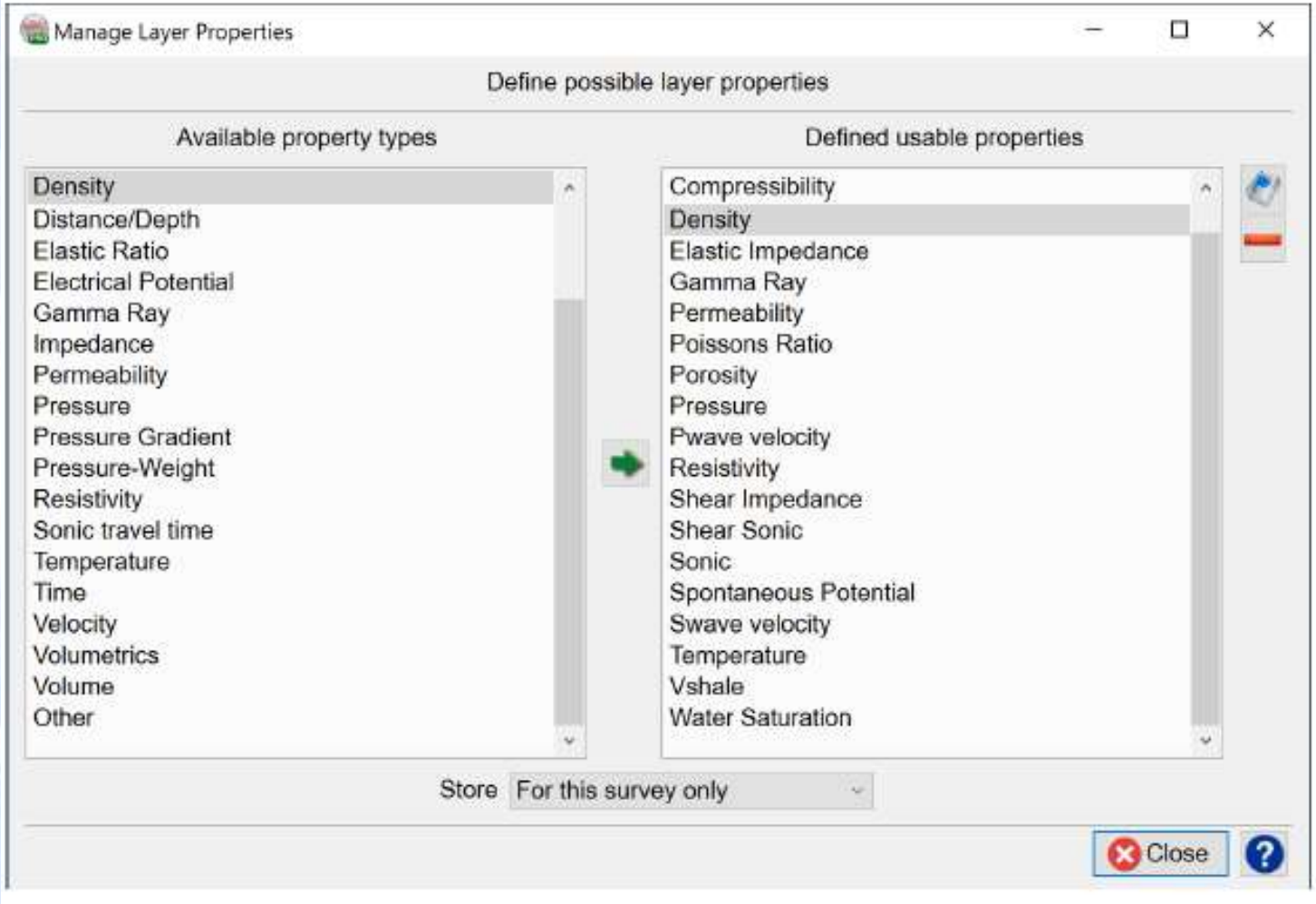


To honor the requirement that horizons cannot coincide, the horizons actual positions are not exactly equal, but they are within one sample position accuracy.

If the lower horizon (red) is selected to be modified, the figure below sketches what will happen to this horizon if you select shift or remove.



4.5.9 Manage Layer Properties



Layer Properties - Definition window is accessible: 层属性的定义窗口

- by clicking the  icon in the *Layer Properties - Selection* window of the *Layer Modeling* module;
- via *Survey > Manage > Layer Properties...* menu.
- **Available property types**: a hard-coded list of available property types.

> *Please contact support if you would like to extend the list of **Available property types**.*

- **Defined usable properties**: a list that contains layer properties available in the current OpendTect project. Some of the most commonly used properties are pre-defined for a user (for example, *Acoustic impedance* property of the *Impedance* type).

> *The type of an existing property can not be changed. A new property of the desired type has to be created instead.*

- **Store**: a level at which layer properties are stored.
  - **For this survey only:** (*default option*) properties are saved at the root of the survey, applicable for all users only for this survey.
  - **As default for all surveys:** properties are saved in the parent Survey Data Root directory (where all OpendTect surveys are located), applicable for all users and all surveys.
  - **As default for my user ID only:** properties are saved to *home/.od* file, which has the priority over the two other sources.

> *The only way to restore the default OpendTect list of properties is to delete the Properties files at all levels.*

Available actions include:

- *Add usable property*: select a property type in *Available property types* list and click on to pop up the *Property definition* window.
- *Edit usable property*: select a property in the list and click on icon (or double-click on a property name) to pop up the *Property definition* window.
- *Remove usable property*: select a property in the list and click on icon.

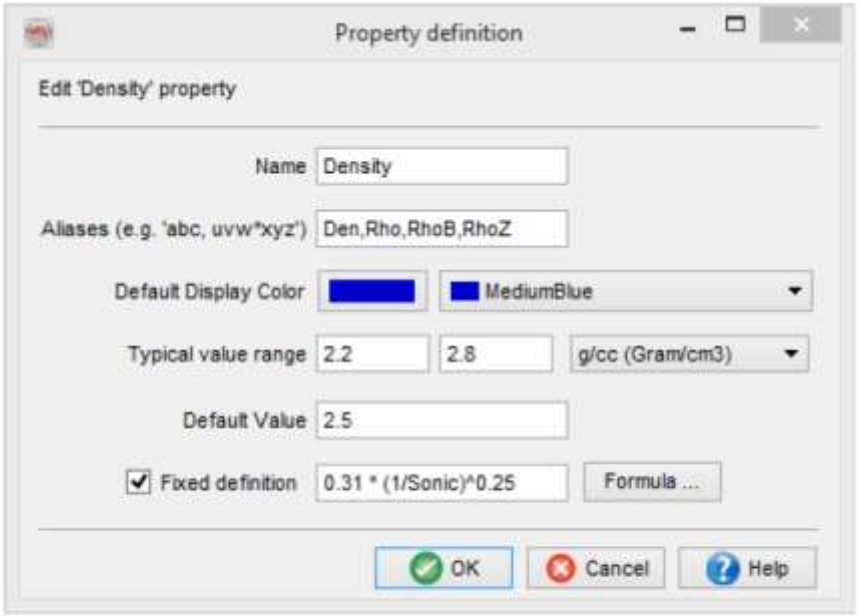
The minimum possible list of properties must include at least one log for each of the following types: Density, Velocity and Impedance.

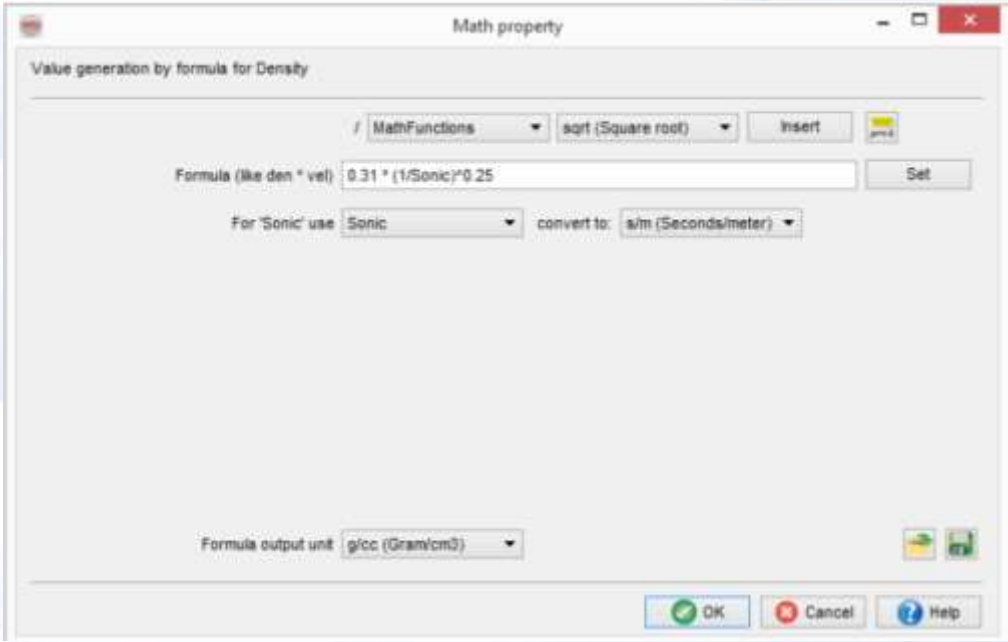
Property definition window: 属性定义窗口

- **Name**: a unique layer property name.
- **Aliases** (optional): specify possible aliases (useful to associate the correct log to a property: logs with different names can thus be related to the same property).
- **Default Display Color**: a default color for a log display.
- **Typical value range**: a typical value range for a property with associated units.
- **Default Value** (optional, but recommended): type in a numeric value or click on *Formula ...* to set a mathematical formula in the *Math property* window (use RockPhysics library to retrieve standard ones). *Default Value* is used to auto-fill property values in layer definition windows (see Layer Modeling chapter), and the auto-filled value can be changed for individual layers.
- **Fixed definition** (optional, but recommended for some properties: see the tip below): type in a numeric value or click on *Formula ...* to set a mathematical formula in the *Math property* window (use RockPhysics library to retrieve standard ones). A property with *Fixed definition* doesn't appear in layer definition windows (see Layer Modeling chapter) as it is always auto-computed in the background.

*A combination of well chosen **Default Values** and **Fixed definitions** can significantly ease and speed up the modeling process. **Default Values** should be preferably set for all properties and should be chosen such that they roughly represent most of the modeled media. For example, specify the default density corresponding to encasing shales and later in the modeling workflow modify the auto-filled values only for target sand layers. **Fixed definition** is recommended for the properties which are defined by specific formulas (i.e. never modeled directly, irrespective of a geological setting): Acoustic and Shear Impedances, Vp/Vs and Poisson's Ratios, Lambda-Rho, Mu-Rho, etc.*

The example below shows Density with a *Fixed definition* using Gardner's empirical relation from Sonic values.





Math formulas can be optionally saved for later use and restored via and icons respectively.

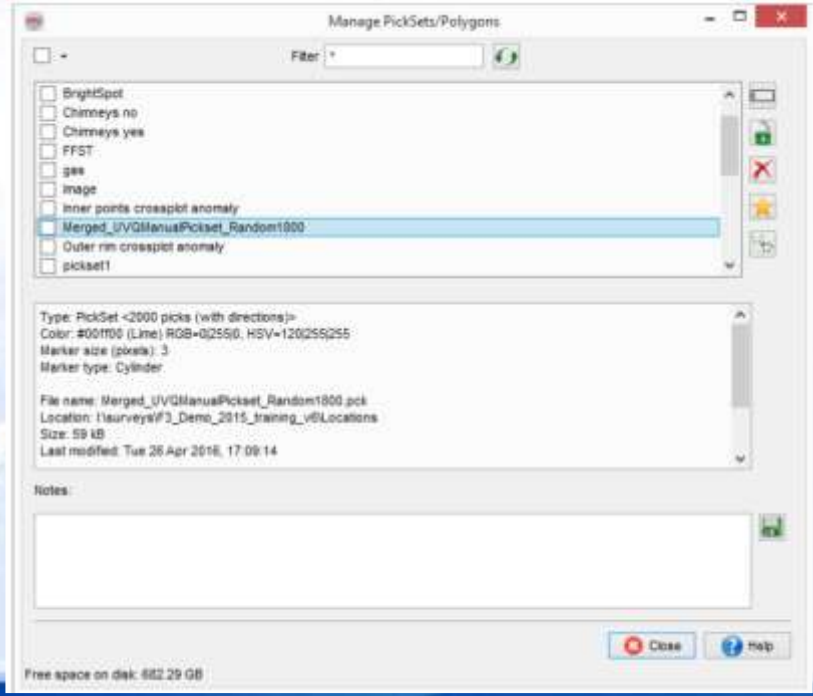
从Sonic值，使用Gardner经验关系，推求Density

4.5.10 Manage Pointsets & Polygons

Manage pointset/Polygon window is accessible:

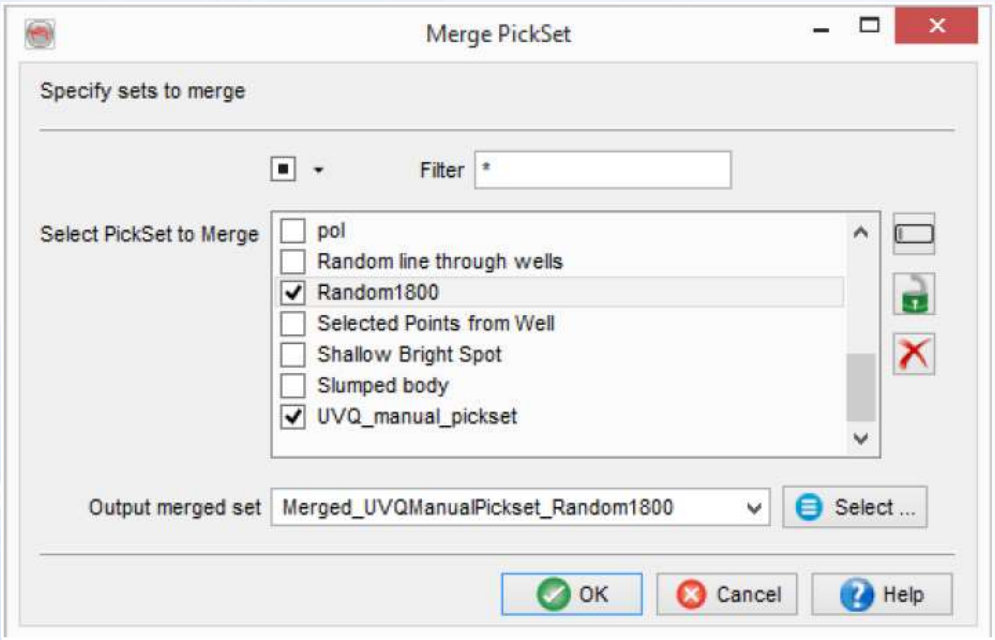
- by clicking the icon in Manage Toolbar;
- via *Survey* > *Manage* > *pointsets/Polygons* ... menu.

All pointsets and polygons available in the current OpendTect project are listed here. The object *Type*, pointset or Polygon, is given in the middle information area.



Available actions on pointsets/Polygons include:

- Rename.
- Lock / Unlock (toggle read-only status on/off).
- Delete.
- Set as the default object of its type.
- Merge pointsets: several pointsets can be merged into one:



The top filter is used to filter-out the objects with selected names. For instance, to display all pointsets that start with letter S use "S".*

4.5.11 Manage Probability Density Functions

Manage Probability Density Function window is accessible via *Survey* > *Manage* > *Probability Density Functions ...* menu.

The manager lists all PDFs available in the current project, allows to view/edit them and generate new synthetic PDFs with user-defined specifications.

- *PDFs may also be imported and/or extracted from crossplots.*
- *Main uses of PDFs in OpendTect are Bayesian Classification and stochastic pseudowell modeling in SynthRock. PDFs can also be exported to a file (ASCII/RockDoc format) for an external use.*

Available actions on PDFs include:

- Rename.
- Lock / Unlock (toggle read-only status on/off).
- Delete.
- Set as the default object of its type.
- Browse/Edit this PDF.
- Generate PDF.

OpendTect supports both discrete and continuous PDFs.

OpendTect支持离散型和连续型的PDF

Discrete PDF:

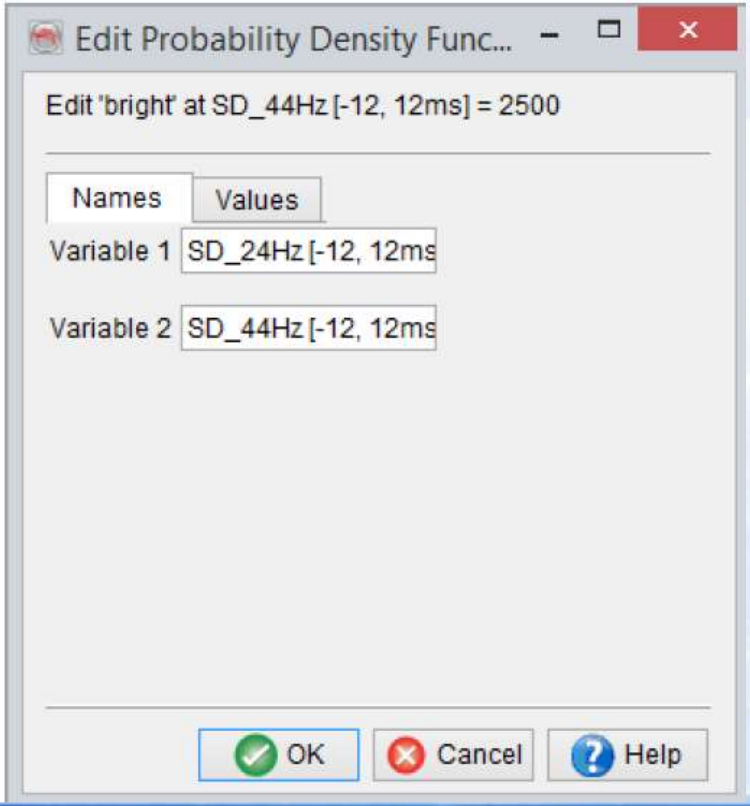
- can be created in OpendTect in one of the following ways:
  - by pressing *Generate PDF* and choosing either *Create an editable PDF filled with Gaussian values*) or (*Create an empty PDF to edit by hand*
  - extracted from crossplots
- up to 3 dimensions;
- each dimension has a discrete number of bins;
- can be browsed, edited and smoothed after creation.

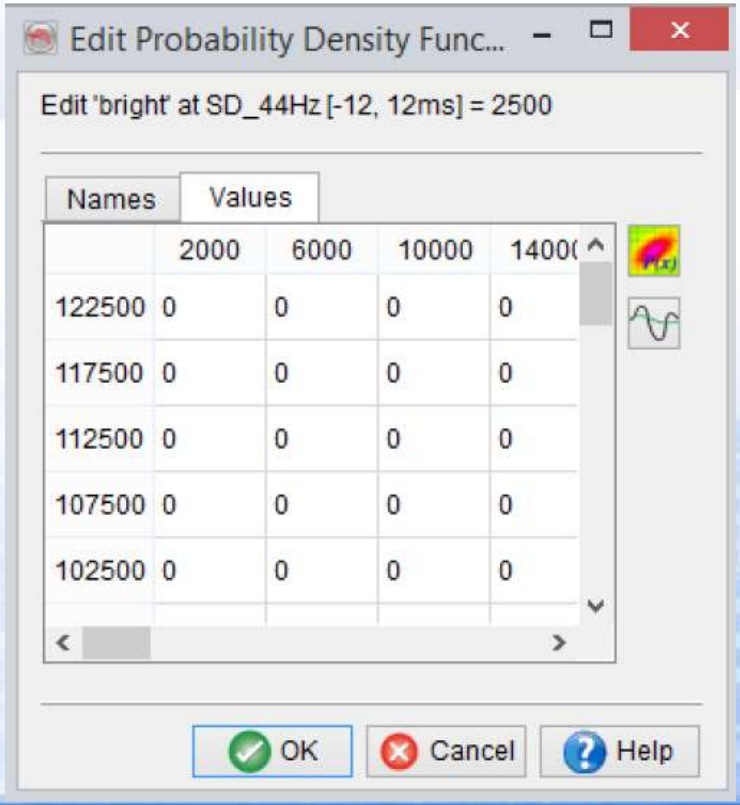
Continuous PDF:

- can be created in OpendTect by pressing *Generate PDF* and choosing *Create a full Gaussian PDF* option;
- unlimited number of dimensions;
- exists only in the description form, corresponding probabilities are computed on-the-fly;
- only the description can be modified.

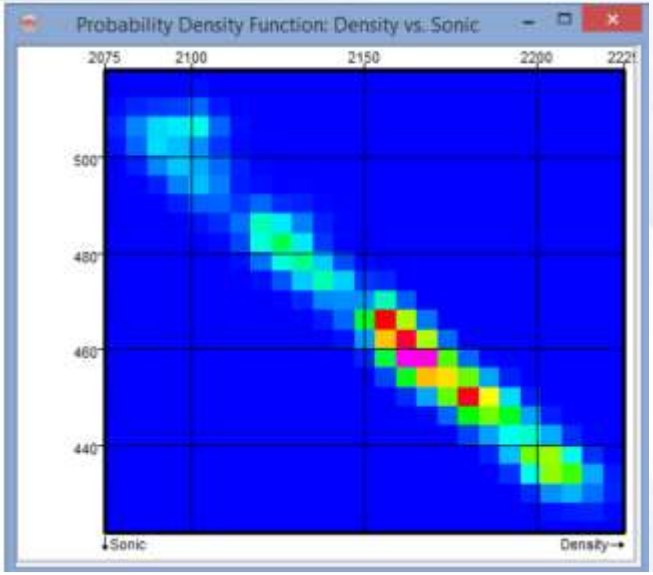
Browse/Edit Discrete PDF

A discrete PDF can be browsed/edited by clicking on  in the *Manage PDFs* window. Names of the variables (dimensions) can be changed in the *Names* tab, and PDF values can be browsed/edited in the *Values* tab. Changes applied in any of the two tabs will be saved only after pressing OK button. A pop-up window gives the choice to overwrite, save as new or cancel changes.





The first icon right of the table ( ) launches a 2D viewer that displays the values seen in the table in a coloured density display. If the PDF has 3 dimensions, the left and right arrows may be used to navigate through the bins of the third variable with increasing and decreasing values respectively.



编辑PDF

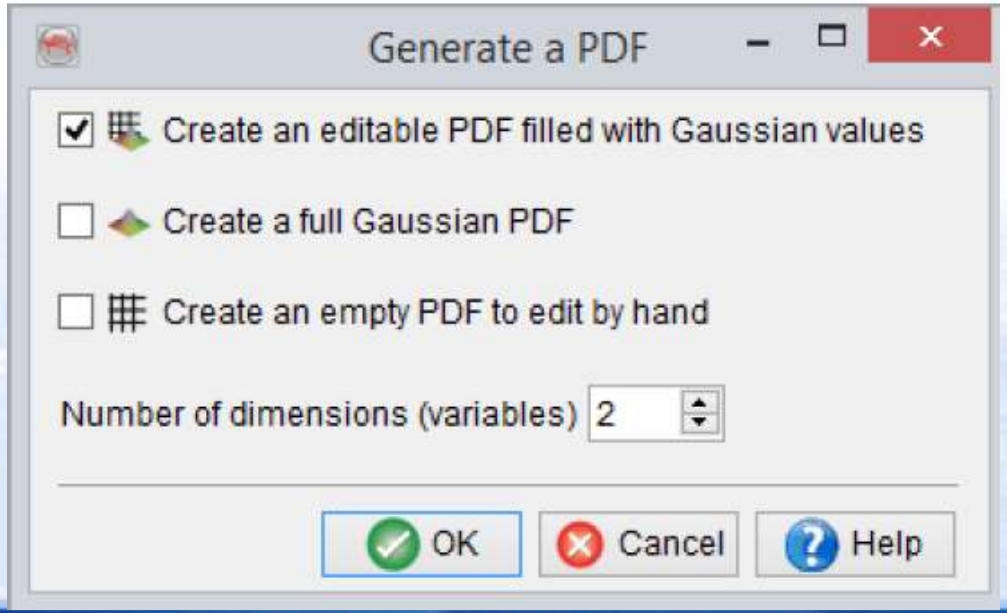
The second icon ( ) (in *Edit Probability Density Function*) performs smoothing of the PDF data. Weighted average of a central sample with 1/2 weight and N neighbouring samples (excluding diagonal neighbours) each with 1/2N weight is calculated at every bin, where N = 2, 4 and 6 for 1D, 2D and 3D PDF. This smoothing is rather gentle, and can be repeated multiple times for a more pronounced effect.

4.5.11.1 Generate Probability Density Functions

User-defined

A user defined PDF can be generated by clicking on the bottom icon ( ) in the Manage Probability Density Functions window.

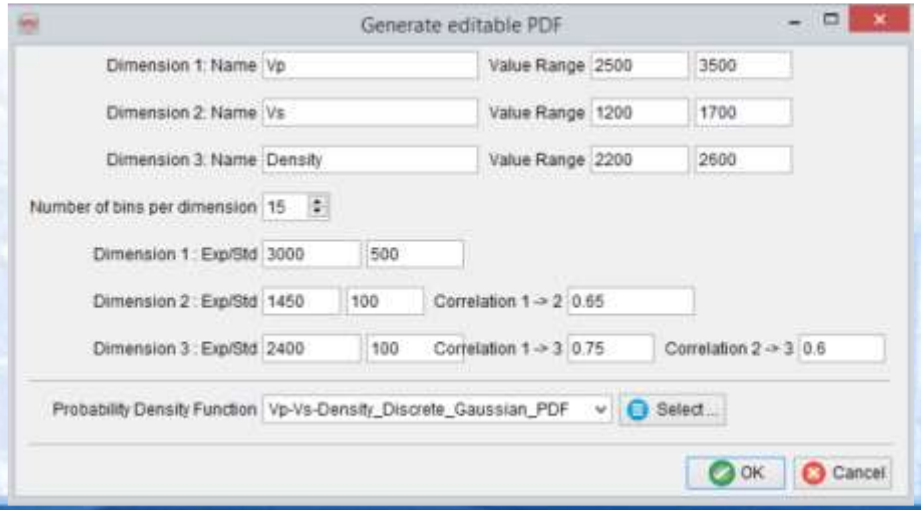
Three types of PDFs can be generated: discrete Gaussian (*Create an editable PDF filled with Gaussian values*), continuous Gaussian (*Create a full Gaussian PDF*), and discrete empty (*Create an empty PDF to edit by hand*).



Discrete Gaussian and discrete empty PDF can have up to 3 dimensions, while continuous Gaussian can virtually contain any number of dimensions. Values of discrete PDFs can be browsed, edited and smoothed after creation since they are stored in tables. Continuous Gaussian PDF exists only in the description form, the corresponding probabilities are computed on-the-fly.

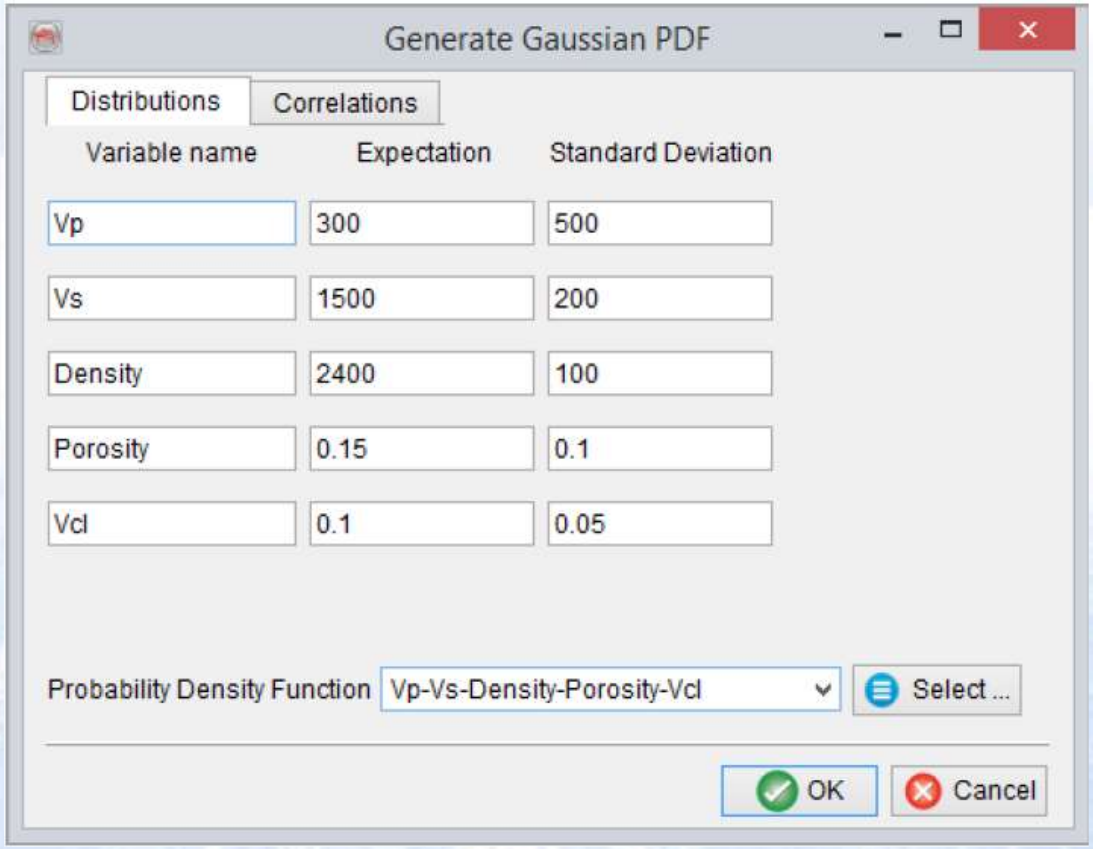
Create an editable PDF filled with Gaussian values

The example below shows generation of a discrete Gaussian PDF with 3 dimensions. Required parameters include dimension *Names, Value ranges, Number of bins per dimension, Expectations, Standard deviations* as well as *Correlation* coefficients between all dimensions (except for 1D). PDF is saved by specifying its name and clicking OK. It can be browsed, edited and smoothed through the Manage PDF window.

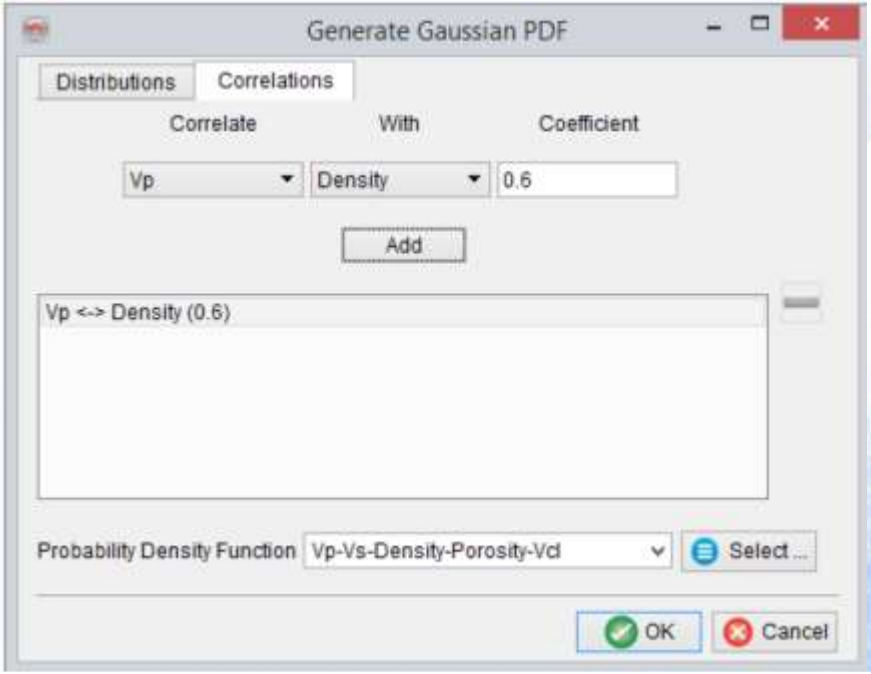


Create a full Gaussian PDF

The next example shows generation of a continuous Gaussian PDF with 5 dimensions. Dimension Names, Expectations and Standard Deviations are specified in the Distributions tab:



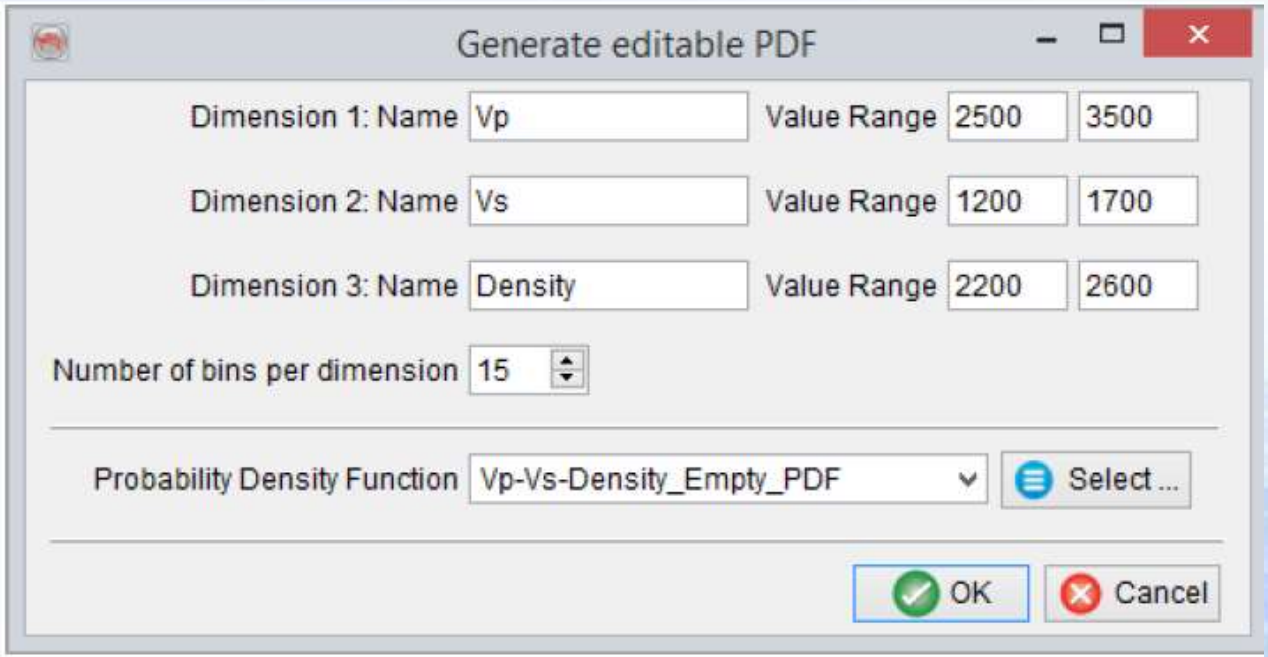
Correlations tab allows to define *Correlations* by selecting dimensions, setting their correlation coefficient and clicking *Add* button. Existing correlation can be selected from the list and edited by updating its correlation coefficient and clicking *Set* (Set button will appear instead of *Add*), or deleted by clicking the*Remove selected correlation* icon ( ). PDF is saved by specifying its name and clicking OK. Continuous Gaussian PDF is stored only in the description form which can be edited through Manage PDF window.



Windows for generation of 1D and 2D continuous Gaussian PDFs shown below do not have Correlations tab

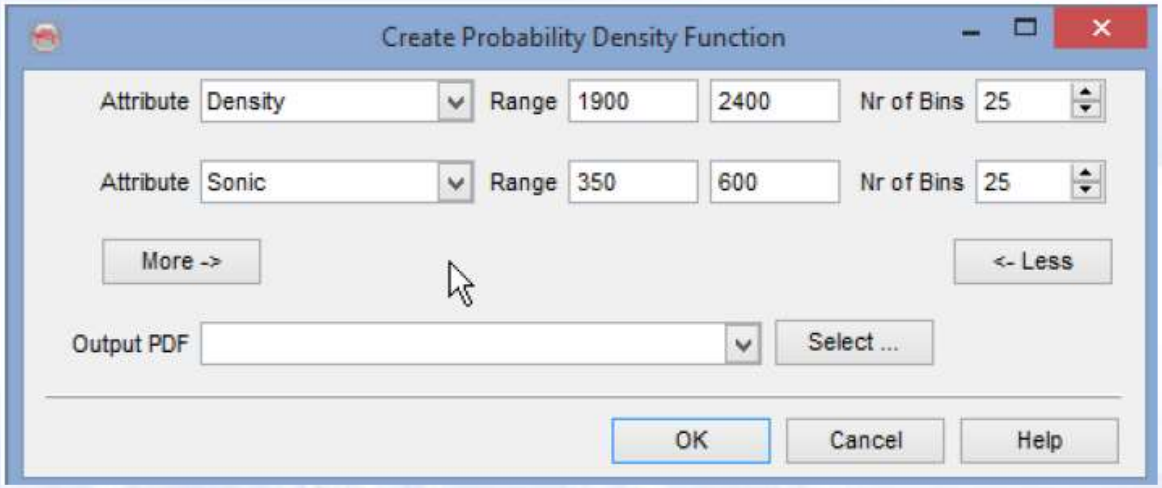
Create an empty PDF to edit by hand

This next example shows generation of an empty discrete 3D PDF. Dimension *Names*, *Value ranges* and *Number of bins per dimension* are required. PDF is saved by specifying its name and clicking OK. After creating empty PDF, probabilities must be filled in manually by clicking on the icon in the Manage PDF window and editing the table.



From Crossplots

Alternatively, a PDF can be created using the Cross-plot tool by clicking on the $P(x)$ icon in Cross-plot window . This icon launches a pop-up dialog that can be used for selecting attributes in order to create PDFs.



The number of PDF dimensions can be set to 1, 2 or 3 by clicking *More* and *Less* buttons. Note that all attributes from the Cross-plot table can be selected. Attribute ranges are generated automatically to fit the extracted data distribution. These can be edited before creating the PDF.