




# 4 Survey - 4.5 Manage


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## 4.5.15 Manage Stratigraphy

The *Manage Stratigraphy* window can be launched with the  icon from OpendTect Manage toolbar or via *Survey > Manage > Stratigraphy...* This window is designed to arrange the stratigraphic markers and the geological sub-units. It is used as base for the Layer Modeling.

The first time you open the manager, a pop up window gives the options to either: 1) build a new stratigraphy from scratch or 2) to open an existing one (North Sea or Simple Reservoir). These two saved stratigraphy description are saved by default in another type of format. If edited, the edited version will be saved as classical stratigraphy description. Once the selection has been done, it is set as default. To re-access the selection window click on the  icon to create/open a new description.

The user can create a specific information about the project and the different regional markers of his/her interpretation. This window is organized as units/sub-units bounded by different stratigraphic markers. Markers are assigned to the category the most on the right of the stratigraphic column. Depending upon user's description, markers can have the same name as seismic horizons or well markers and the units the names of epochs/eras.

To start, the user has two ways to display the stratigraphy tree: the time view and the tree view. The time view is chosen to display the absolute geological time while the tree view shows an overview of unit/sub-unit as leaves.

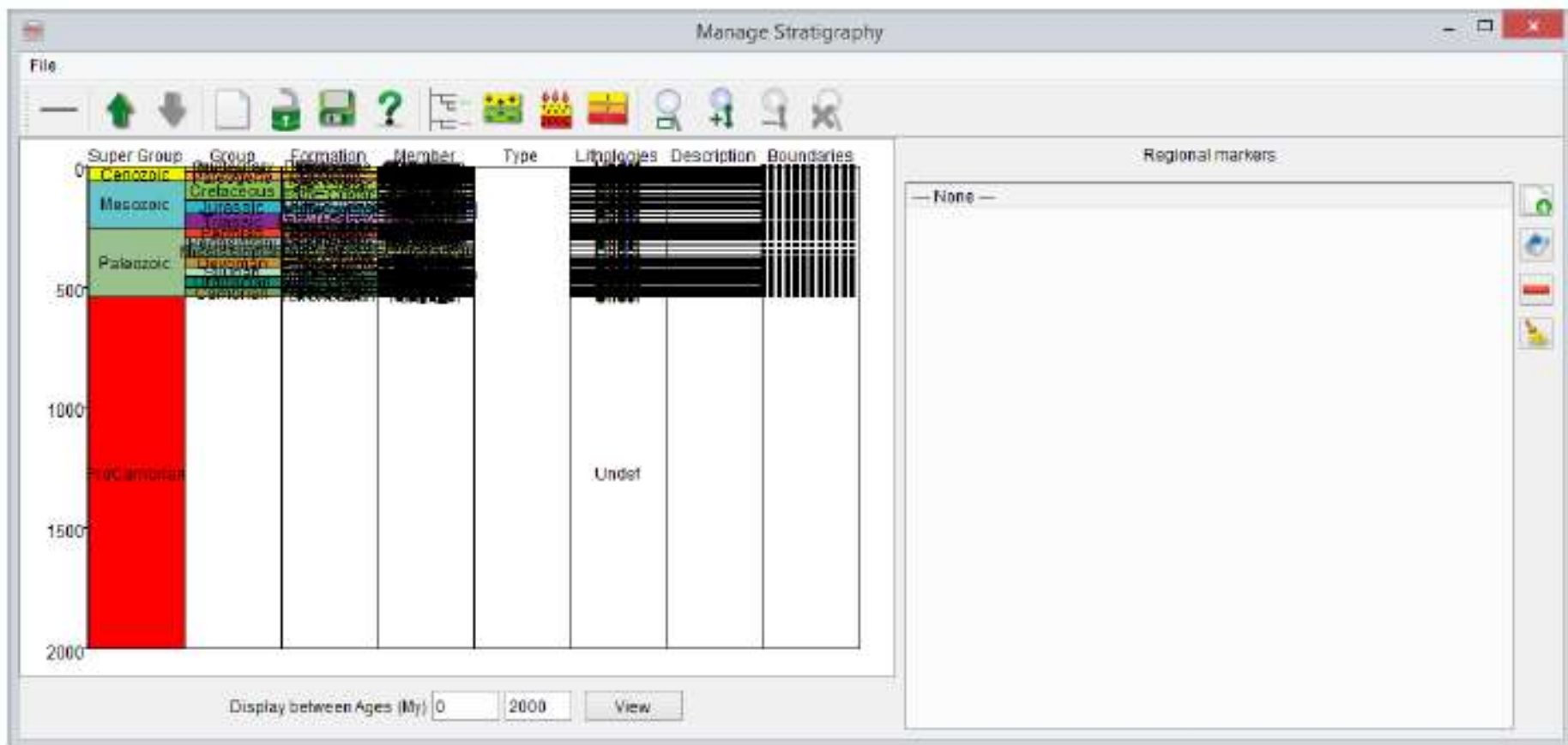


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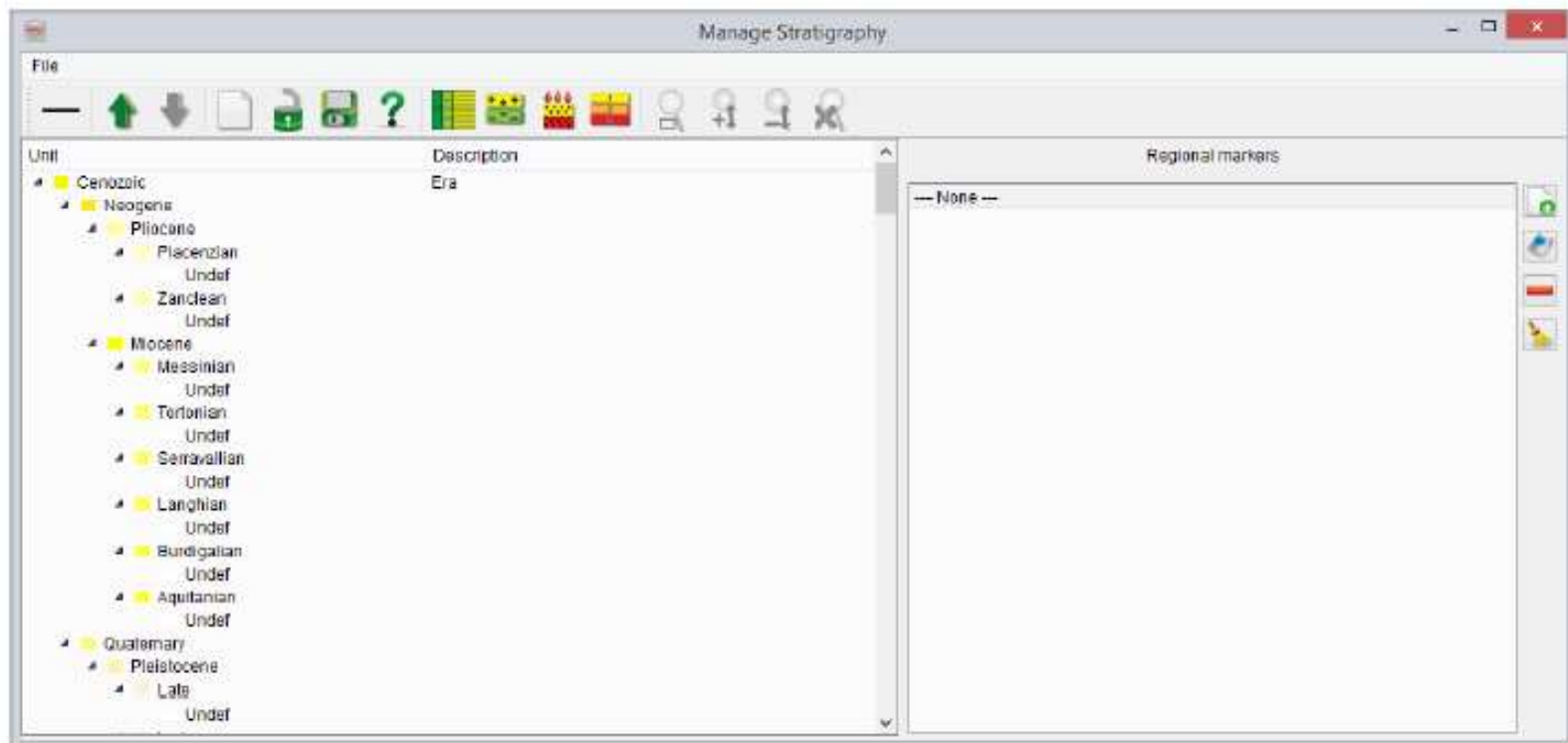
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Stratigraphy window: The time view






Stratigraphy window: The tree view




## 1. Regional Markers:

The regional markers can be associated to boundaries of stratigraphic units. These markers are added on the right-hand panel. Right click on ---None--- in the regional markers panel. And in the pop-up menu select the *Create New...* option. In the *CreateLevel* window, write an appropriate name for the stratigraphic marker and optionally provide the color. Press *Ok* to add the marker. They should have a coherent name. In the Well Marker Manager, markers can be linked to a regional marker and will be then renamed after it.. The inserted marker can then be assigned/linked as a top and base of the stratigraphic unit.

Create level

Name

Color  RoyalBlue ▼

 OK  Cancel  Help



## 2. Stratigraphic Units:

On the left hand side of this window, the units are classified in a way that the top and base of each unit belong to certain marker. For the initial unit, right-click on <Click to Add>, the stratigraphic unit editor will pop up:

The image shows a screenshot of the 'Stratigraphic Unit Editor' dialog box. The window has a title bar with standard Windows controls (minimize, maximize, close). Below the title bar, the text 'Edit the unit properties' is displayed. The main area contains several input fields: 'Name' with a text box containing '<New Unit>', 'Description' with an empty text box, 'Color' with a color selection area showing a green swatch and the text 'OliveDrab', and 'Time range (My)' with two spinners showing '412,0' and '416,6'. Below these is a 'Lithologies' section with a list box containing 'Undef', 'sand', 'shale', 'limestone', 'dolomite', 'halite', and 'anhvdrite'. The 'Undef' option is selected. To the right of the list box is an 'Edit ...' button. At the bottom of the dialog are three buttons: 'OK' (with a green checkmark icon), 'Cancel' (with a red X icon), and 'Help' (with a question mark icon).

Stratigraphic Unit Editor

Edit the unit properties

Name: <New Unit>

Description:

Color: OliveDrab

Time range (My): 412,0 416,6

Lithologies:

- ☒ Undef
- ☐ sand
- ☐ shale
- ☐ limestone
- ☐ dolomite
- ☐ halite
- ☐ anhvdrite

Edit ...

OK Cancel Help





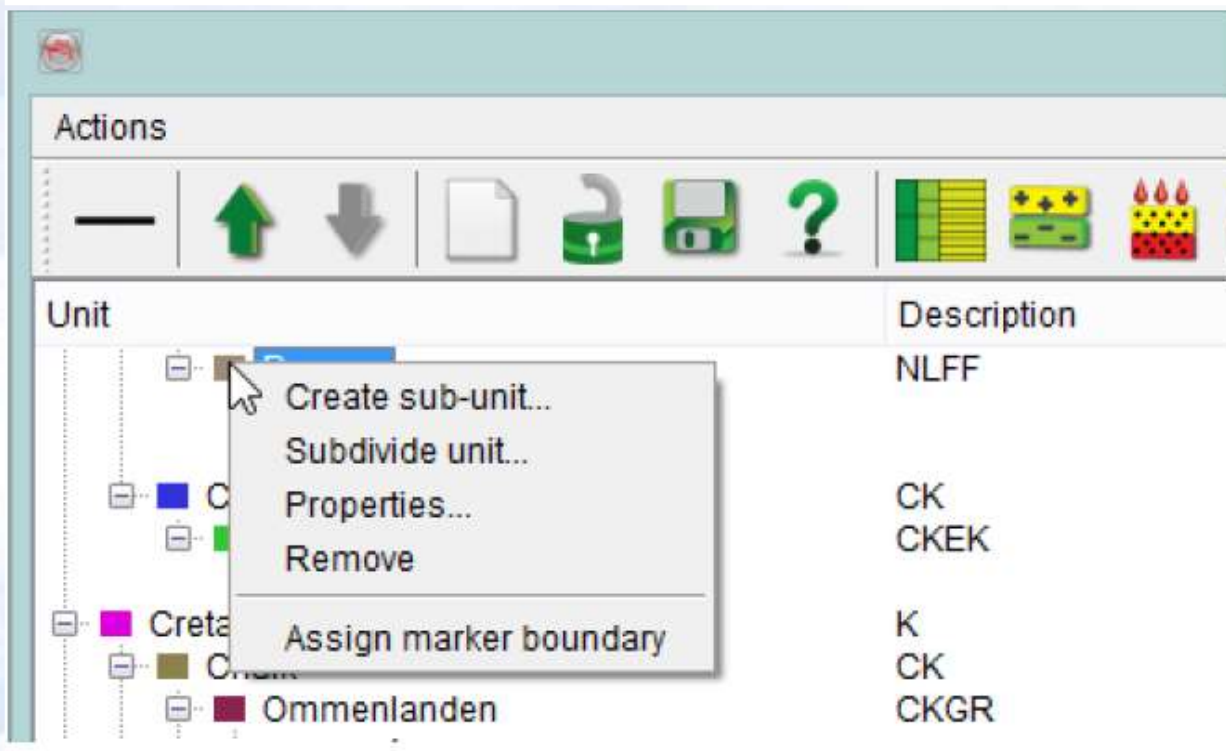
In this window, give a name of the unit area, the description, color, the age and lithology.

The minimum requirement for creating a new unit is simply to define the name.

To add a lithology: Click on "*Edit*" then give the name, and optionally specify porosity then *Add as new*, click on *Ok*.



To add a sub-unit, right-click the unit name and select *Create sub-unit*, and define it in the same manner as a unit. Description and lithology of the unit can be added now or edited later.







**Stratigraphic unit properties:** Properties such as unit/sub-unit description and lithology can be defined or edited by right-clicking on the unit/sub-unit name and selecting Properties. A unit/sub-unit specific lithologic name can be entered directly into the Lithology field. For lithologies that may occur in multiple units/sub-units, a lithology can be defined and made universally available by clicking the Select button next to the Lithology field. In this Select Lithology window, the lithology type can be named, and added to a list that will be made available for all units/sub-units in this session. (Depending on your Save settings, these lithologies can be available outside of this session.) These options can also be defined when the unit/sub-unit is first added.

The screenshot shows the 'Stratigraphic Unit Editor' dialog box with the following fields and options:

- Name:** <New Unit>
- Description:** (empty text box)
- Color:** A color swatch showing a brownish-orange color, with a dropdown menu currently set to 'Peru'.
- Time range (My):** Two spinners showing '45,000' and '5,000'.
- Lithologies:** A list box with the following items:
  - ☐ Under
  - ☒ sand
  - ☒ shale
  - ☐ limestone
  - ☐ dolomite
  - ☐ halite
  - ☐ anhydrite
- Edit...** button next to the Lithologies list.
- Buttons:** OK, Cancel, and Help at the bottom.



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**Save as:** The defined stratigraphy can also be saved at different levels, e.g. *Survey levels*, *OpenText data level*, *User level*, or *Global level*. For instance, if it is saved at *Survey level*, the stratigraphy will only be available for this survey. Alternately, if it is saved at a higher level, it will not be limited to only the survey in which it was defined.

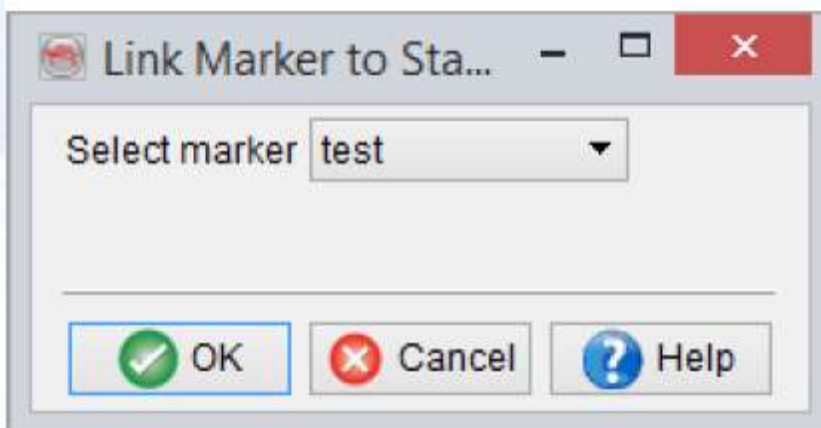






## Assign Marker boundary:


This option links the regional markers with stratigraphic units. Right-click on boundary or unit/sub-unit then click on *Assign marker boundary* select regional markers top and bottom that are the appropriate boundaries for the unit/sub-unit.

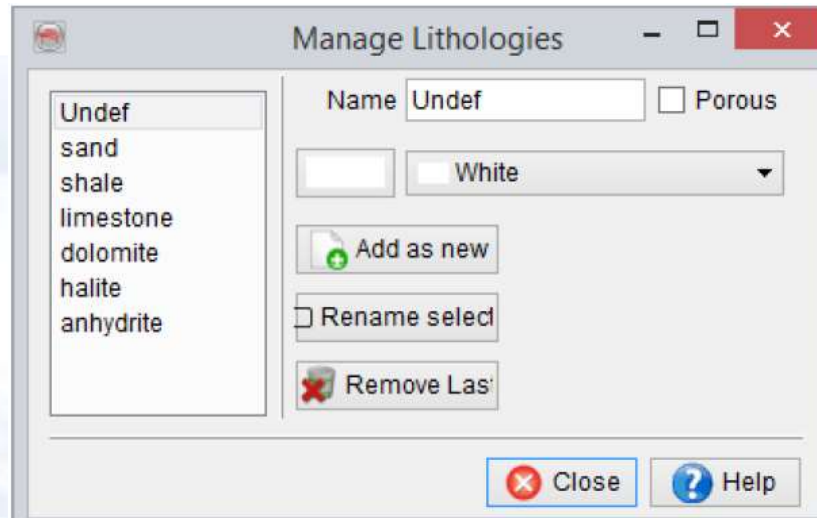






## 4.5.15.1 Manage Lithologies

The *Manage Lithologies* window can be launched by clicking on the  icon in the main *Manage Stratigraphy* window. It allows to define the list of lithologies possibly present in the stratigraphic column. This list is then available when defining the different units of the stratigraphy. For Layer Modeling, the lithologies listed for each units are used in the layer description.



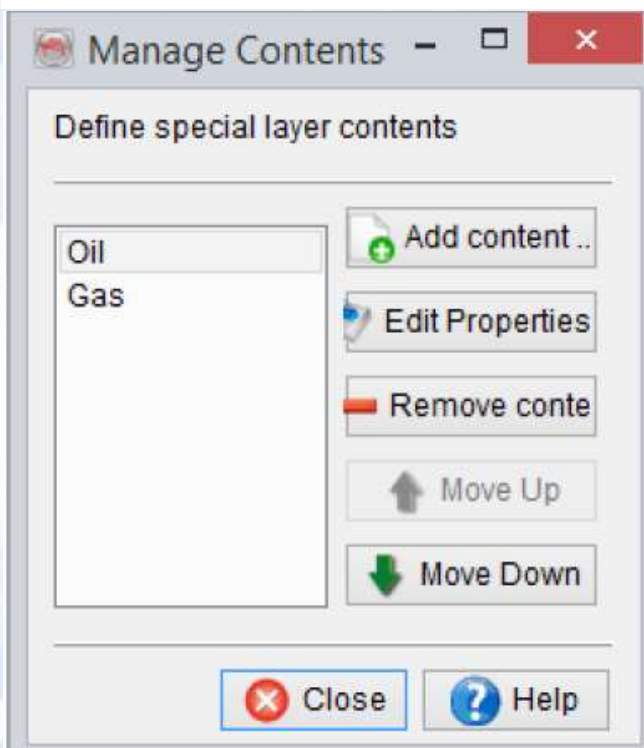
Following tasks can be performed:

- Lithologies can be added or removed
- Lithologies can be renamed
- Lithologies can be ascribed various colors
- Lithologies can be specified as Porous/Non-Porous by toggling on/off Porous (this is used if fluid substitution is carried out in further analysis with SynthRock plugin)



## 4.5.15.2 Manage Contents


Manage Contents can be accessed by clicking on the 🍰 icon in the *Manage Stratigraphy* window.



This option is used to define a set of fluid contents. Afterwards, fluid(s) from the list can be assigned to lithologies for each layer when defining *Layer properties* for Layer modeling.



### 4.5.15.3 Layers & Synthetic Modeling

The  icon starts the Layer/Synthetics modeling feature.

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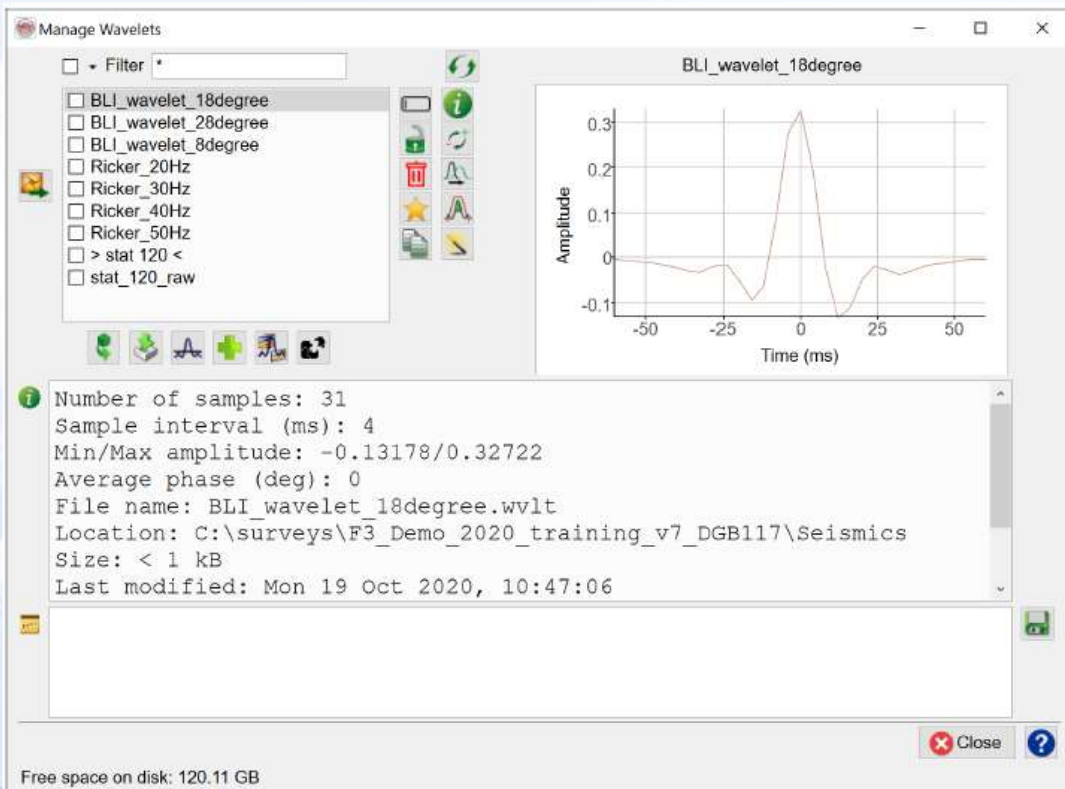




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## 4.5.16 Manage Wavelets

This window is available from the *Survey > Manage > Wavelets...* menu and from the  icon. It provides management tools for wavelets. The left panel shows the available wavelets. The selected wavelet is visualized on the right panel. The storage information of the active wavelet is shown in the lower panel.





The following actions can be performed:


The Filter is used to filter-out the objects with selected names. For instance, to display all wavelets that start with letter W use '&quot;W\*&quot;.


Options:

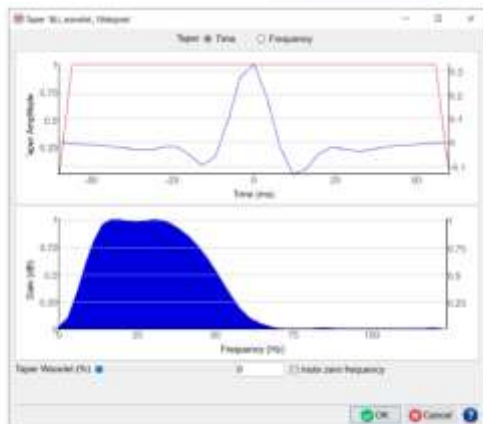
Alongside the standard 'Manage' options (*Rename*, *Lock*, *Remove* and *Set as Default*), you may also, via this window:


 Display a wavelet's properties dialog:

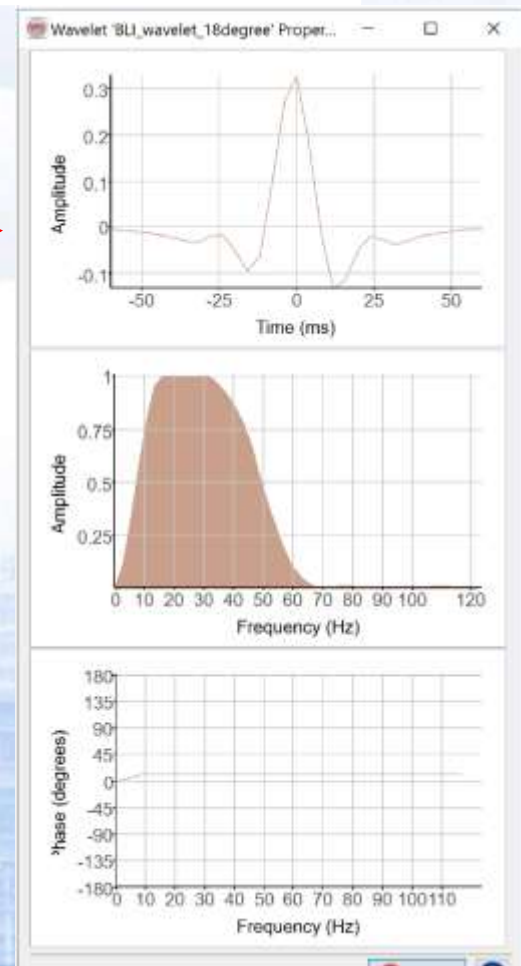
 Change polarity

 Manually rotate a wavelet

 Taper a wavelet:



 COLOP: Design an operator for coloured inversion, spectral bluing and spectral whitening.





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Additional options are available below the list of Wavelets:



Import a wavelet from another survey



Import a Wavelet from an ASCII file



Create a wavelet of type Ricker or Sinc



Stack Wavelets



Extract Wavelet from 2D or 3D data





## 4.5.16.1 Import Wavelet

When clicking on the *Import* button, the import wavelet dialog box pops up. Please follow the instructions in Import Wavelet section.

Import Wavelet

Input ASCII File  Select ... Examine

File header No header

Format definition <Incomplete> Define ...

Scale factor for samples

Wavelet  Select ...

Import Cancel Help



## 4.5.16.2 Generate Synthetic Wavelets

Create Wavelet

Specify wavelet creation parameters

Wavelet type ☒ Ricker ☐ Sinc

Central Frequency (Hz) 25

Sample interval (ms) 4

Peak amplitude 1

Wavelet ▼ Select ...

OK Cancel Help

*Generate a wavelet*

Two types of synthetic wavelet are available - "Ricker" and "Sinc".



## 4.5.16.3 Statistical Wavelet Extraction

Statistical wavelets can be extracted from the seismic data.

The User first needs to choose the input seismic, i.e 3D volume or 2D line.

If 3D seismic is selected, the following window pops up:

It is recommended to use a sub-selection of the seismic data, e.g. every 10th inline/crossline, and to use horizons to guide the extraction. The extract length of the seismic data should be at least 1 second TWT.

The wavelet length should never be too small (min 50ms), or too large (200ms max). A rule of thumb is that the first side lobe should be fully contained in the wavelet.



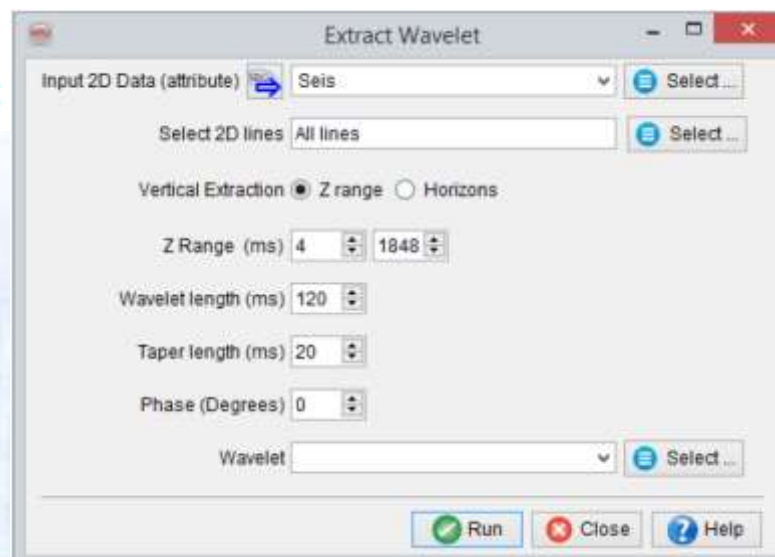


The extraction is performed using the following workflow:

1. Seismic traces are extracted and tapered
2. The auto-correlation of the seismic traces is computed, using the length of the desired wavelet
3. The frequency spectrum of the auto-correlation is computed.
4. The square root of the modulus of the frequency spectrum is taken, the zero Hertz component is muted to zero.
5. The inverse FFT is computed.
6. The zero phase wavelet is the real part of the inverse FFT output

The output phase rotation cannot be set in the current version. It is being implemented.

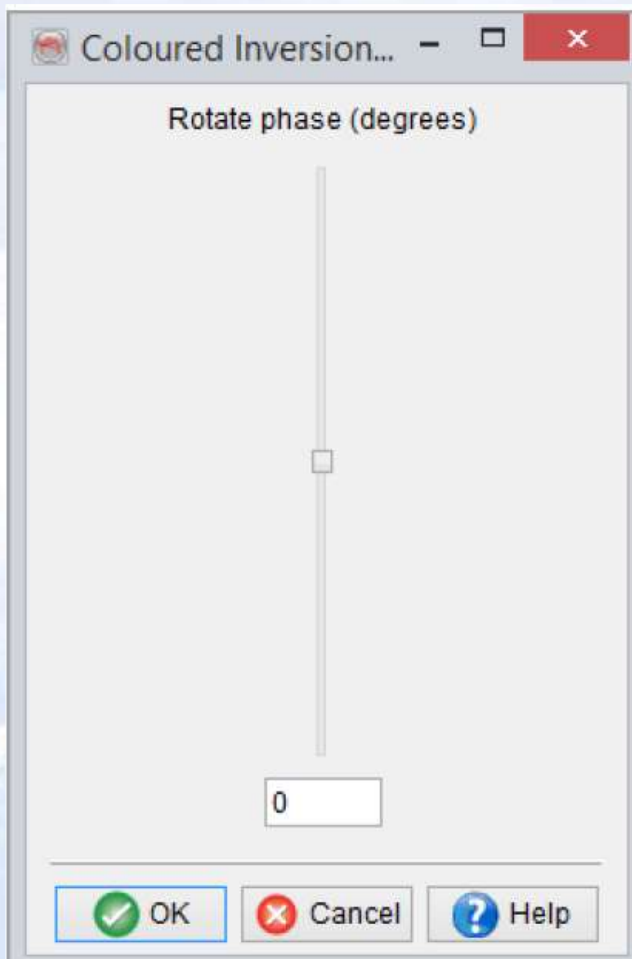
The Wavelet extraction in 2D line is shown below:





## 4.5.16.4 Rotate Phase


The phase of wavelets can be altered and saved using the following slider:



The new phase will be set when pressing "Ok".

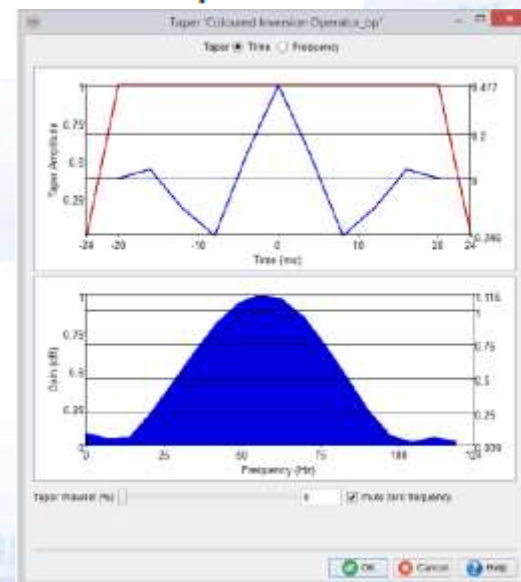


## 4.5.16.5 Taper a Wavelet in Time or Frequency Domain

A wavelet tapering window is launched by pressing the  icon from the wavelet management window. A wavelet is tapered in time or a frequency domain, depending what is selected from the top of the panel (see below).

In time domain, the selected wavelet is tapered by selecting a tapering percentage (%), which is set from the slider available at the bottom of the window. This is done by moving the slider left or right. Additionally, the amplitudes at zero frequency can also be muted by setting check to *mute zero frequency* check box.

In frequency domain, the tapering can be applied to both ends of an amplitude spectrum, i.e. high and low frequencies. This is applied with a given slope (dB/Octave) value and placing the slider to an appropriate min/max position (Hz). The red line in the amplitude spectrum shows the resultant tapering pass, which is updated according to the given settings.







## 4.5.16.6 Merge Synthetic Wavelets

Two or more wavelets can be stacked using this option. The wavelets can be 'Normalized' and/or 'Center' at maximum amplitude/energy.

