2 开始使用

Li

OpendTect V6.6 由荷兰dGB公司开发

开源部分(GNU)和商业部分(Pro)

- Under the GNU GPL license.
- Under the OpendTect Pro license.
- Under an Academic license.

- OpendTect Pro and dGB Plugins
- ARK CLS Plugins
- EarthWorks & ARK CLS Plugins

支持多平台

- Linux (64bit)
- Windows 10 and 11 (64bit)
- Mac OS X 10.14 (Mojave) and 10.15 (Catalina)

商业许可证

- Geoscience
- Machine Learning
- Attributes & Filters
- Sequence Stratigraphy
- Inversion & Rock Physics

2.1系统概览

OpendTect v6.6是面向工程的地震解释系统。项目组织为Survey，定义了网格的地理区域，将XY坐标与inline，crossline位置联系起来。

3D地震数据体必须位于定义的勘测边界内，2D线和测井允许在勘测范围以外。

可以加载多个3D数据体，有不同的方向、bin-sizes和时间采样率，到一个Survey。数据体可以与定义的Inline，Crossline勘测网格不匹配，这些数据会旋转和重采样到网格上。

2.1系统概览

OpendTect的2D和3D地震数据管理外，还管理prestack seismic data, well data (tracks, markers, logs), horizons, faults, fault- sticks, geobodies, mute functions, velocity functions, pointsets, polygons, and wavelets。

OpendTect的内部格式是CBVS (Common Binary Volume Storage)，但不要求必须使用该格式。仅扫描一次并读取SEG-Y格式文件。

OpendTect Pro用户还可以直接访问Petrel数据存储，还可以与SeisWorks/OpenWorks/GeoFrame-IESX数据存储交互。

多个OpendTect Survey可存储在Survey Data根路径下（在安装时就创建了）。也可以从Survey设置窗口下创建根路径(Survey -> Select/Setup菜单)。

OpendTect支持2D和3D视图。3D视图可以以TWT和Depth显示数据，以及沿一个层位flatten图像。完成转换。

2D视图，展示地震数据，测井，交叉图，prestack gather。

应用

- 2D/3D地震数据解释—层位，断层，地质体等
- 评估属性和计算属性体（2D地震情况为断面）
- 使用各种叠后过滤，增强地震数据
- 可视化叠前gathers，计算AVO属性
- 处理网格和测井
- 找到地震数据与测井的联系，预测储层属性
- 作为研发新应用或插件的平台

属性

OpendTect就是分析地震属性和模式识别的系统。

地震属性分析是核心功能。

对显示的元素应用属性，交互式计算属性（及filter），on-the-fly计算，也可以动画风格计算属性参数。

OpendTect支持大量属性到属性(attributes from attributes)的计算，也可以创建用户自定义的属性（通过使用数学和逻辑运算）。

OpendTect以active attribute set模式工作（可以自动加载一个属性集，下次打开survey时就是active的），操作步骤：打开属性设置窗口->File->Autoload Attribute set。

多台机器的批处理 （OpendTect的特色功能）

地震属性计算非常耗时，on-the-fly计算没有效率。从一个存储的数据体恢复数据更快。

可以在单台机器，或所有电脑，或集群上，批处理属性数据体。

多机器处理需要额外的安装，参考”系统管理员文档”。

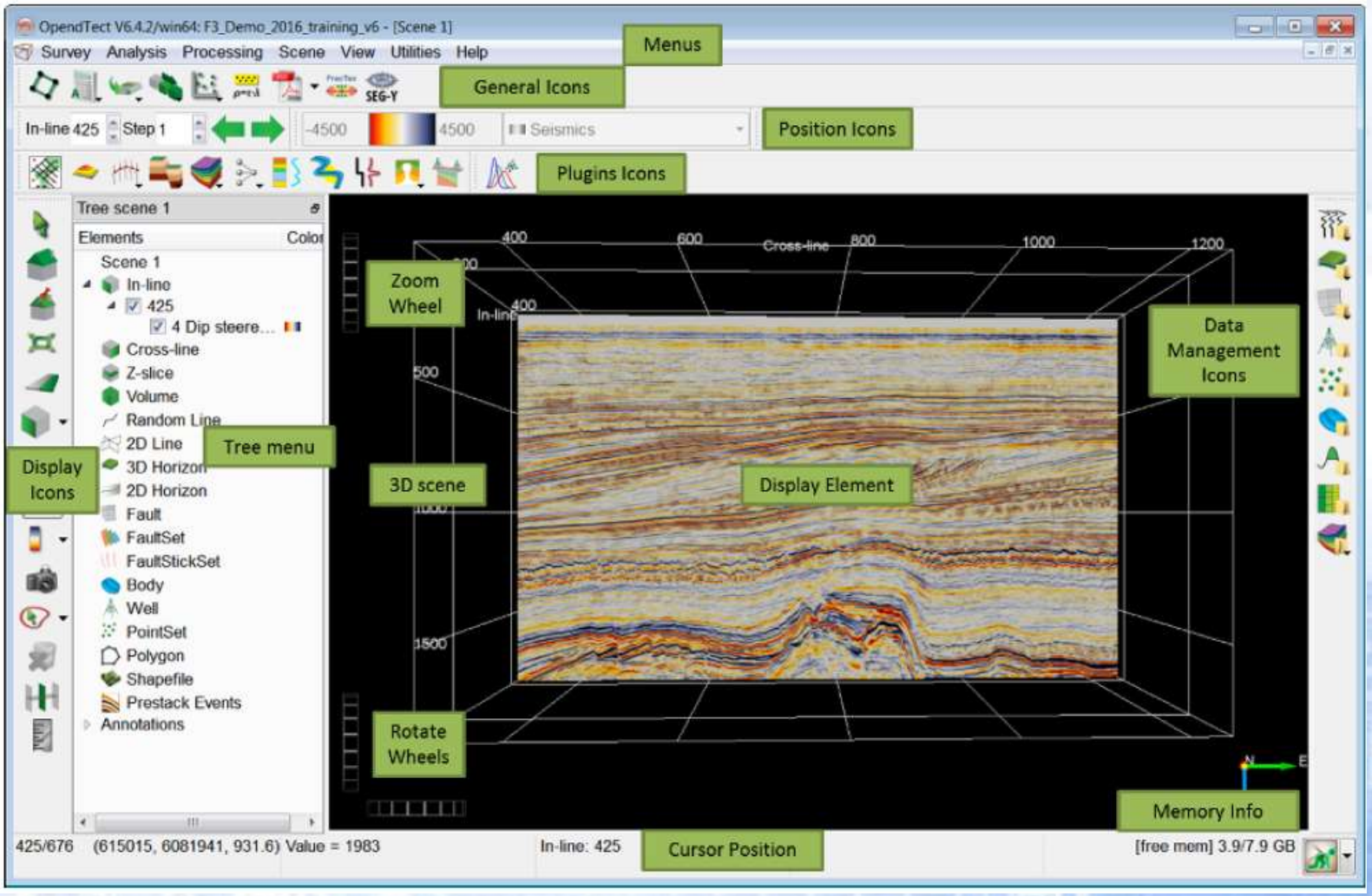
OpendTect的并行化计算，后面有专门的介绍。

内存

使用虚拟内存：设置环境变量

export OD_USE_VIRTUALMEM=yes

用户界面


OpendTect V6.4.2/win64: F3_Demo_2016_training_v6 - [Scene 1]
Survey Analysis Processing Scene View Utilities Help
Menus
General Icons
In-line 425 Step 1
-4500 4500 Seismics
Position Icons
Plugins Icons
Tree scene 1
Elements
Scene 1
In-line
425
4 Dip steere...
Cross-line
Z-slice
Volume
Random Line
2D Line
3D Horizon
2D Horizon
Fault
FaultSet
FaultStickSet
Body
Well
PointSet
Polygon
Shapefile
Prestack Events
Annotations
Tree menu
Display Icons
Zoom Wheel
3D scene
Display Element
Data Management Icons
Rotate Wheels
Memory Info
425/676 (615015, 6081941, 931.6) Value = 1983
In-line: 425
Cursor Position
[free mem] 3.9/7.9 GB

用户界面

Tree menu不表示工程的数据库。

3D视图，右键点击树单元，选择数据

仅当定义了属性集后 

，才能选择属性。

还可以显示很多展示以及使用flat (2D)视图解释()，

元素(inlines, cross-lines, Z-slices, random lines, horizons, 2D lines)。

2.2工具条

2.2.1 OpendTect Toolbar

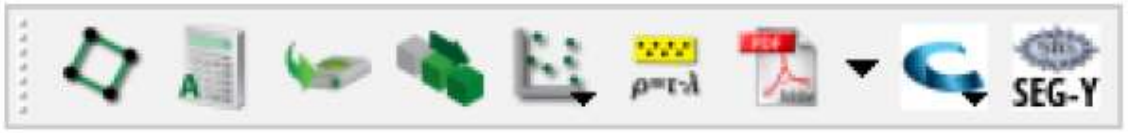
有2类图标：

（1）执行某种具体动作，例如  移动当前显示元素(inline, crossline, Z-slice)向前N步；

（2）打开一个有多种选项的菜单，例如  启动2D属性或3D属性的定义窗口。

有些图标一直在工具栏，有些仅当动作适当时才出现。例如，

2.2.1 OpendTect Toolbar



starts the Survey definition module

starts the Attribute module 3D or Attribute module 2D

starts the 3D output module or the 2D output module

starts the Volume builder

starts Attribute vs. Attribute crossplot or Attribute vs. Well Data crossplot

leads you to the Rock Physics library

starts the PDF-3D Plugin*

starts the import utility

* These are commercial plugins, that are available under license.

2.2.2 Manage Toolbar

启动具体模块的图标：

从管理工具栏中，你可以启用管理工具，用来copy, delete, rename工程中的各种数据对象。

2.2.2 Manage Toolbar

Opens the Seismics Manager (options for 3D, 3D Prestack, 2D and 2D Prestack)

Opens the Horizons Manager (options for 3D and 2D) 层位管理

Opens the FaultStickSets Manager 断层束集 管理

Opens the Well Manager and the Well Data Management interface. This is also the place to create new logs using OpendTect's rock physics library. 测井管理

Opens the PointSet/Polygon Manager

Opens the Bodies Manager

Opens the Wavelet Manager

Opens the Stratigraphy Manager 层位体管理 商业许可证

Opens the HorizonCube Manager* (options for 3D and 2D)

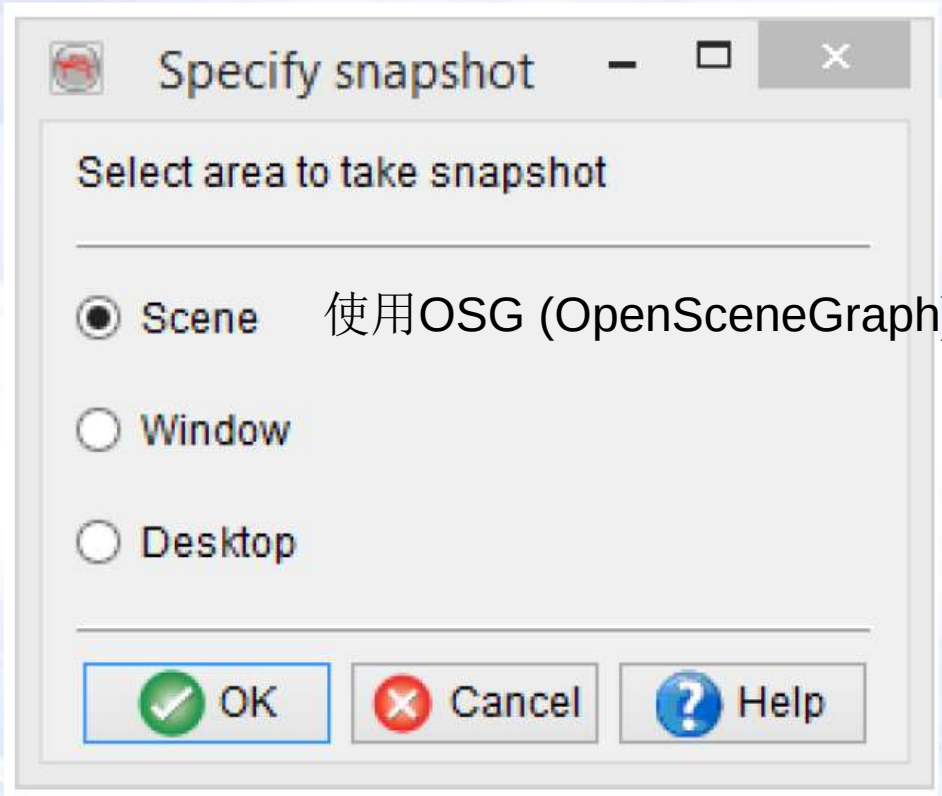
* HorizonCube is a commercial plugin, available under license.

2.2.3 图形工具栏

操作3D图形窗口，有如下选项：

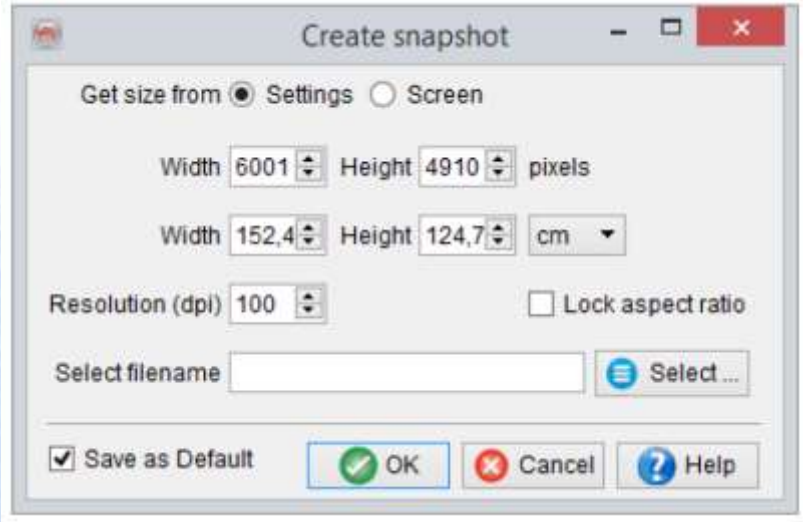
2.2.3.1 Take Snapshots

Scene, *Window*, and *Desktop*

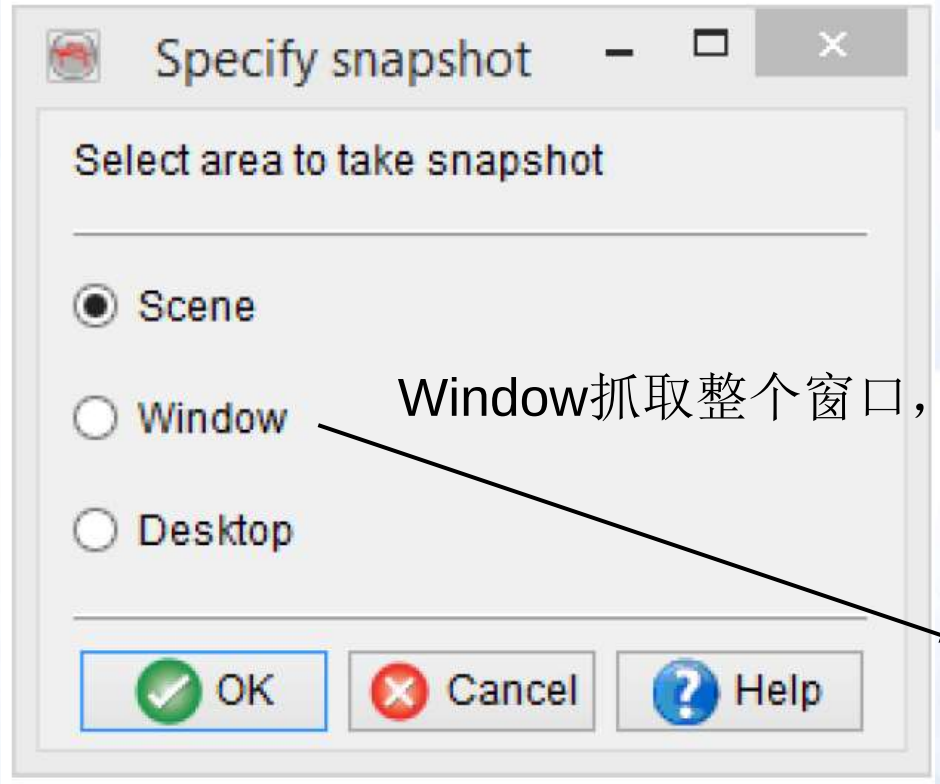


使用OSG (OpenSceneGraph) 3D 库

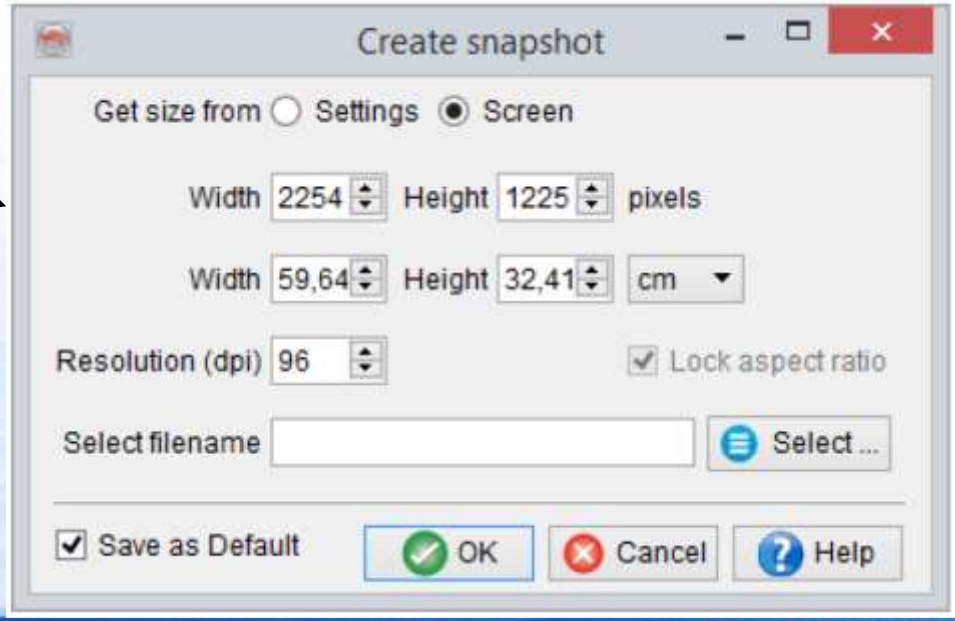
可设置保存图像的分辨率



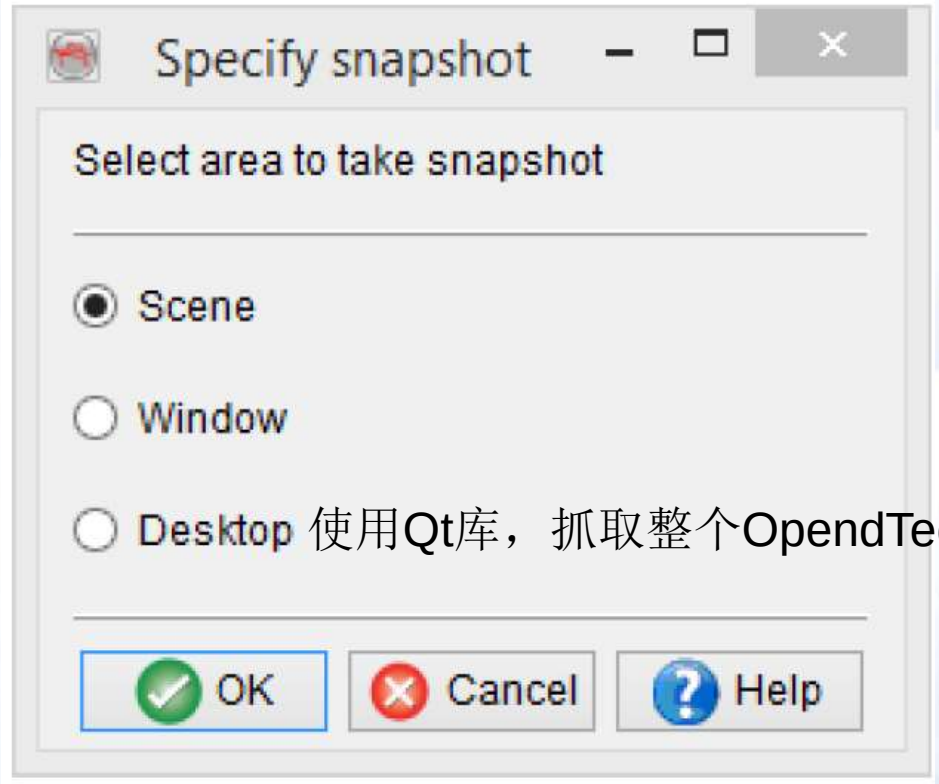
2.2.3.1 Take Snapshots



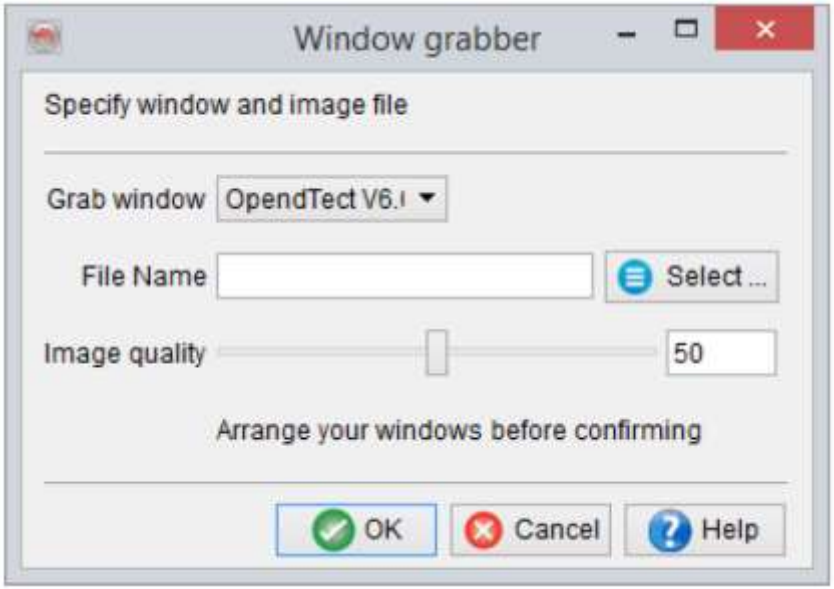
Window抓取整个窗口，包括sidebar

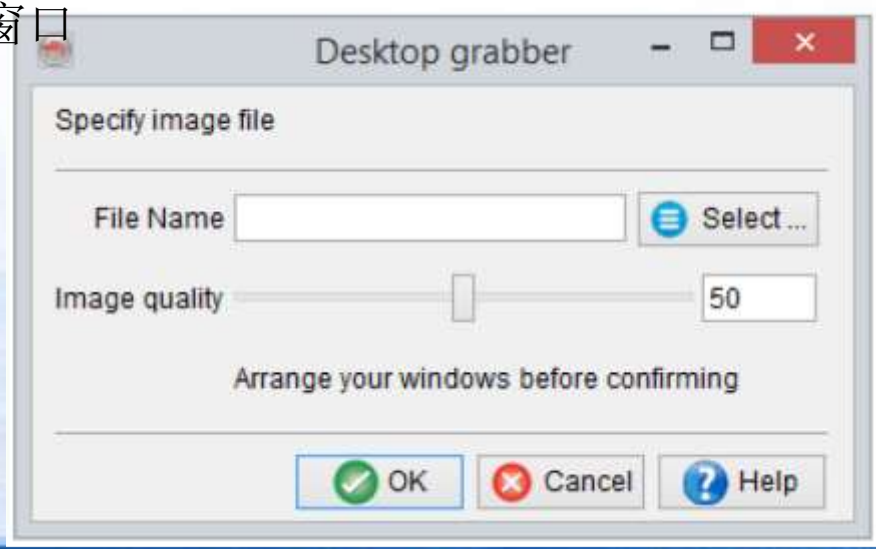


2.2.3.1 Take Snapshots



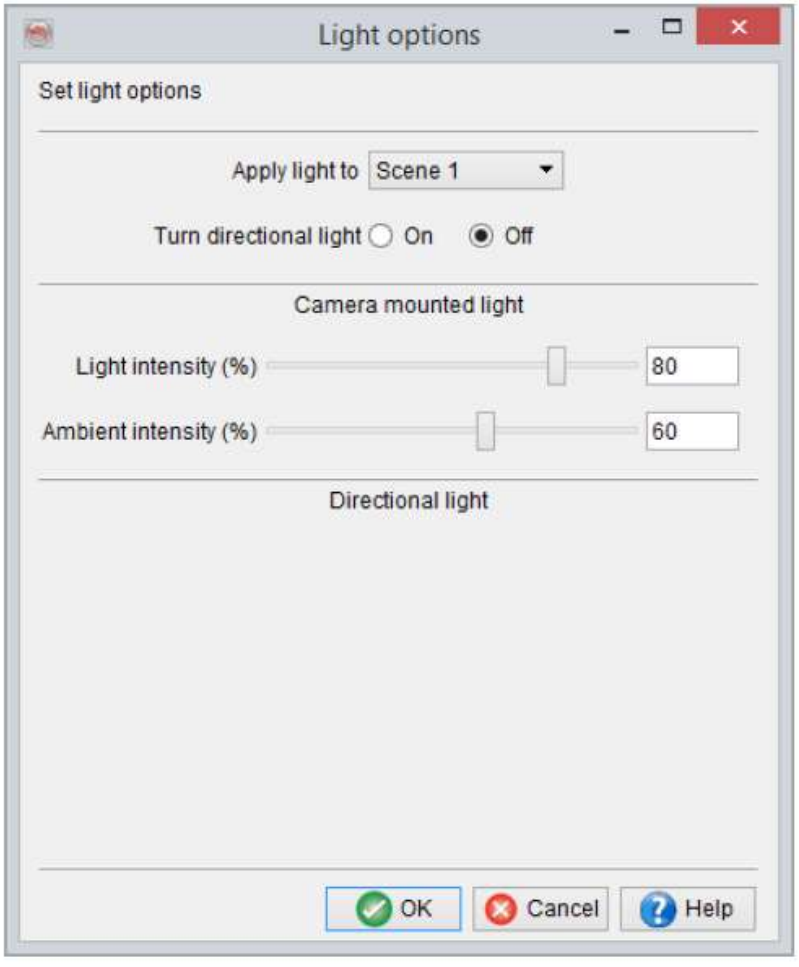
使用Qt库，抓取整个OpendTect窗口



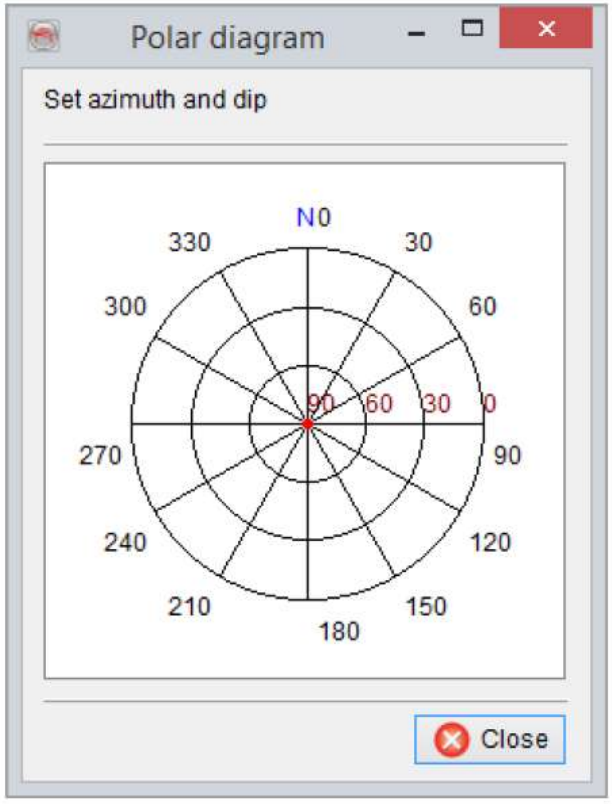


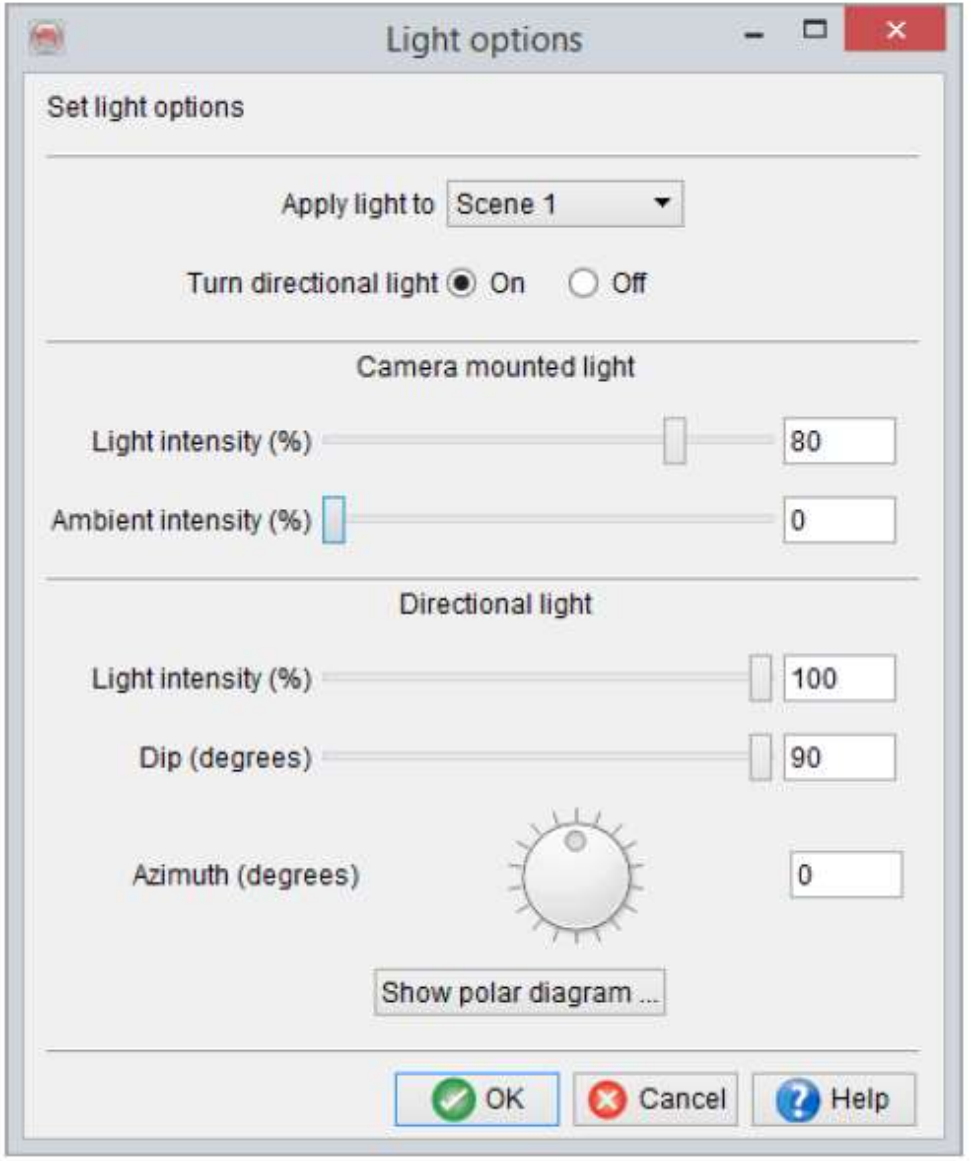
2.2.3.2 Directional Lighting

方向照明，照亮对象（显示的数据），从定义的倾斜(dip angle)和方位角(azimuth)。



2.2.3.2 Directional Lighting





2.2.4 切片定位工具

切片定位工具条，定位显示单元(inline, crossline or timeslice)，以指定步数通过3D数据体。

进度条

个人设置(Utilities, Settings, Look and Feel)。假设计算机内存足够，建议Pre-load地震数据到内存(Survey, Preload)。进度信息将为预加载的数据体关闭。

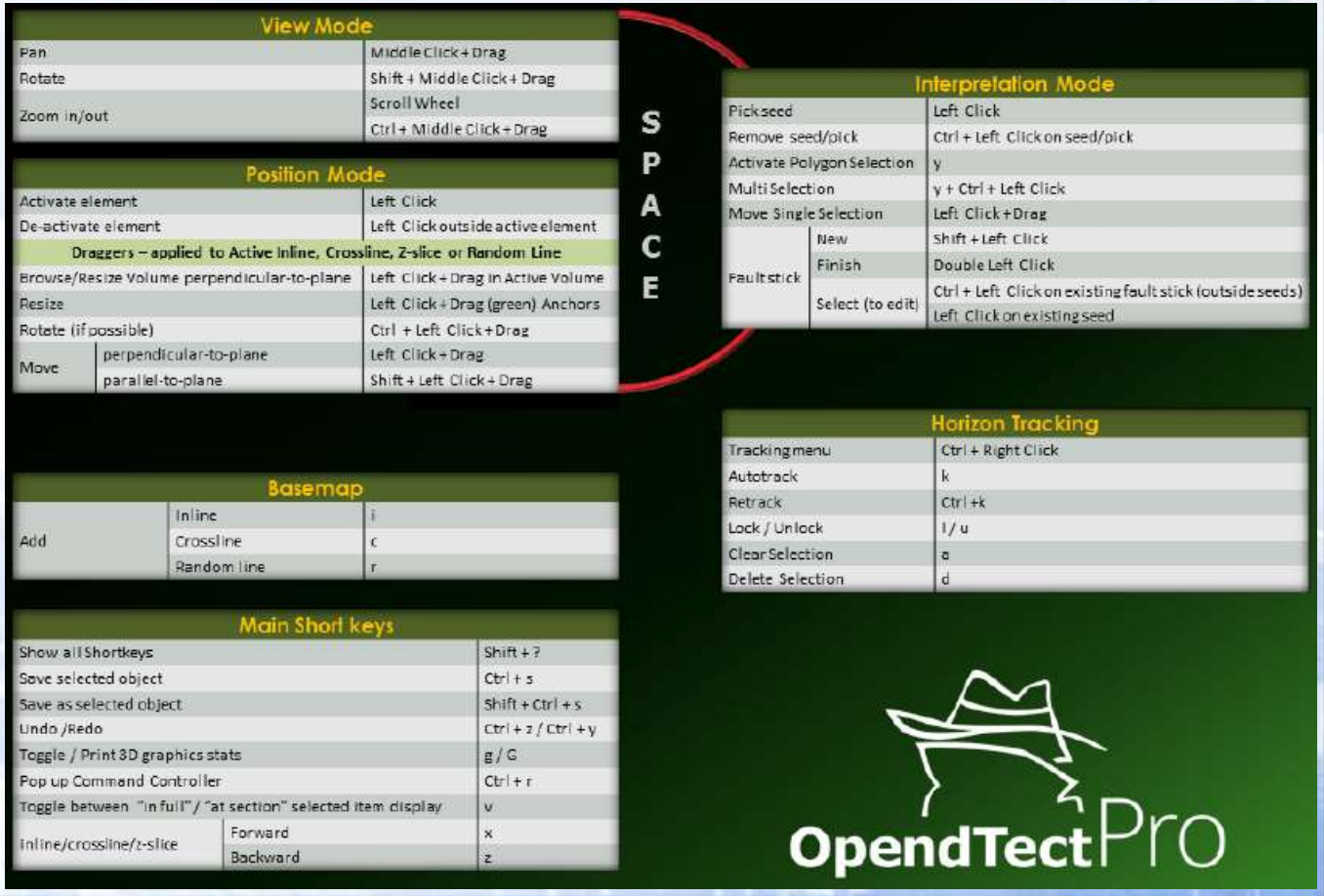
2.3鼠标控制—场景和图形交互

3D场景交互，3种交互模式：定位模式、视角模式和解释模式

热键和鼠标控制：

Pan
Rotate
Zoom In/Out

Basemap功能是Pro软件中的（许可证）。



2.4 颜色表

A colortable is a predefined group of color settings that can readily be applied to any attribute. This group includes items such as the primary colorbar, undefined color settings, color segmentation, and opacity. Changes made to the colortable are applied universally to any item that uses that colorbar.

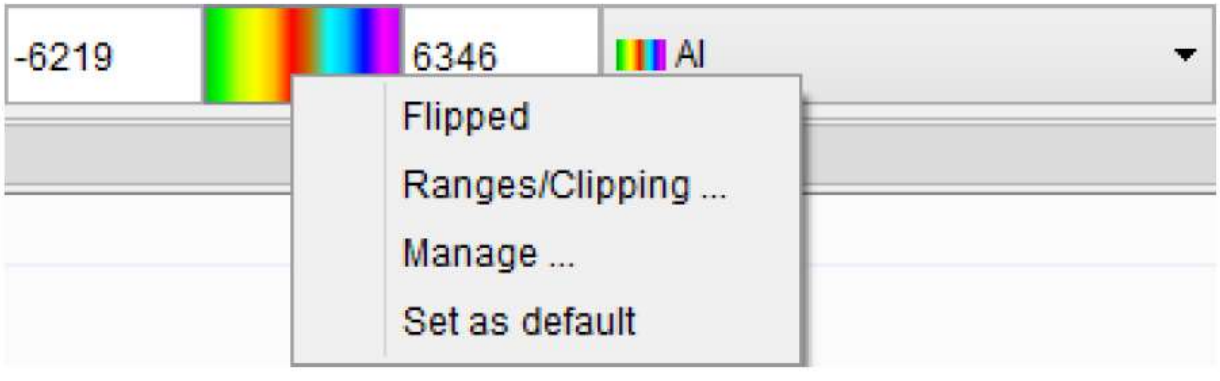
A colorbar is the specific colortable for a particular element's (line/horizon) attribute that is displayed in a scene. Updating the colorbar can update the selected element's attribute. The image below is an example colorbar:

2.4 颜色表

The colorbar is composed of four elements: the color display itself, the minimum and the maximum value of the variation for the colortable (as it is defined for the currently selected item), and a set of colortables.

This drop down list of predefined colortables appears when the user clicks on the name of the colortable being used in the colorbar (ex: Channels). If no item is selected in the tree, the colorbar will not show any value/range although it can be manipulated. The colortable is manipulated by right-clicking on the colorbar.

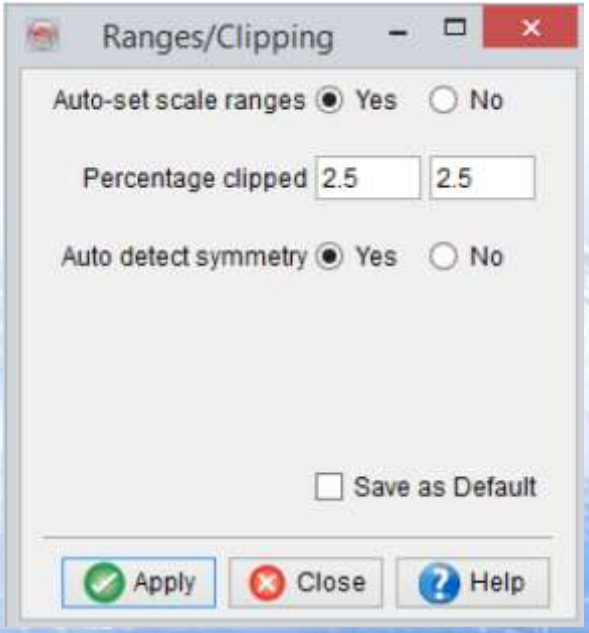
The pop-up sub-menu contains several manipulation functionality. These are described in the following:



2.4 颜色表

Flip causes the scale to be flipped. (The color assigned to the high value, now becomes the color assigned to the low value, etc.)

Ranges/Clipping allows the user to change the range of the color scale, or clip a certain percent of the scale. Please be aware that because of display time consuming, only 2000 random sampling points are by default used to clip data. The clip values thus change from one data set to another.(An alternate method for clipping is described in the Inline, Crossline & Z-slice sub-chapter).



2.4 颜色表

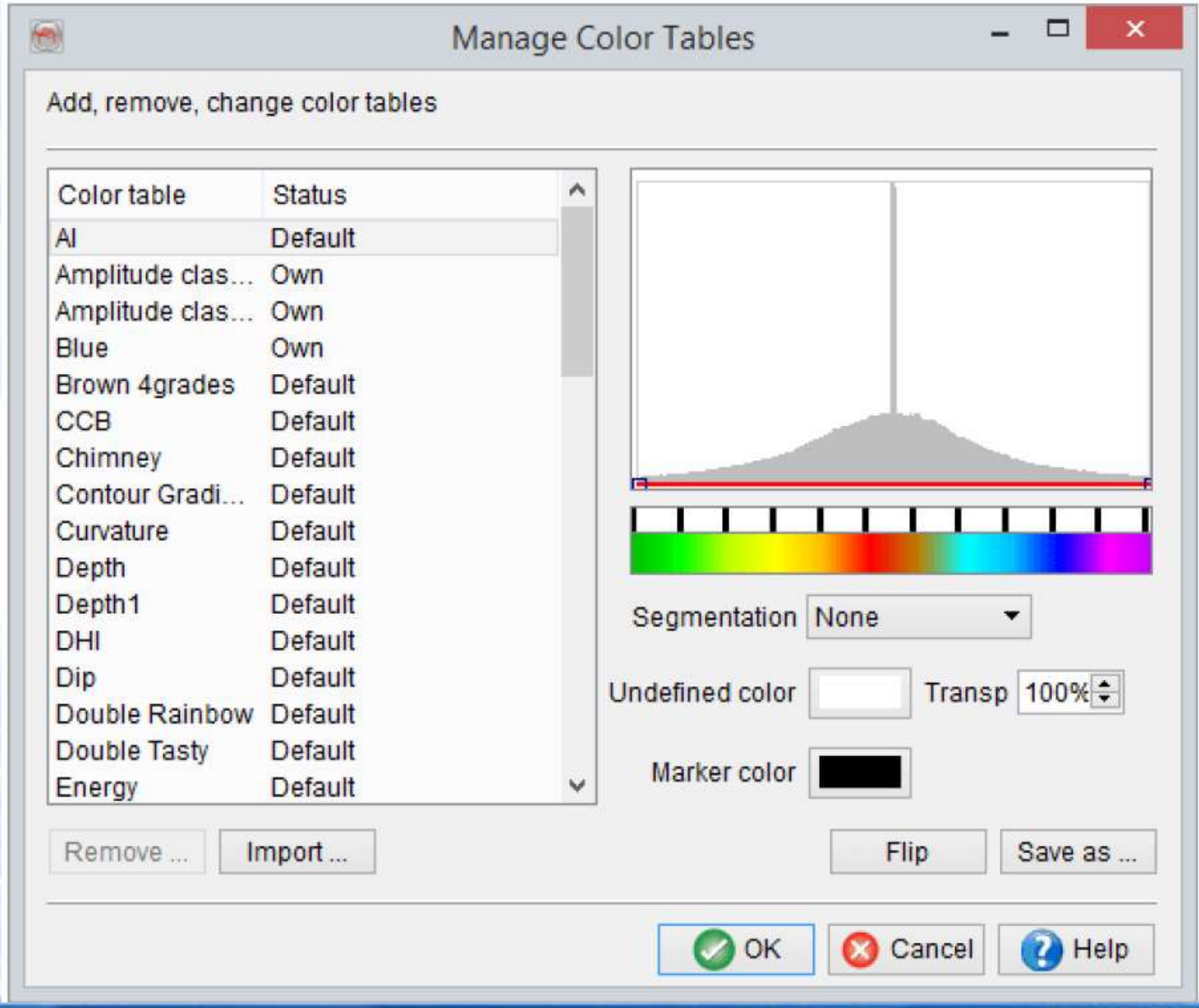
Set as default sets the current color settings as the default color scheme for all elements in the tree.

Manage is used to modify the current colortable and to create new colortables with the current one as a starting point. Colortables are modified by adding, removing, changing colors, varying opacity, and defining the colorbar to be gradational or segmentized. The effect of the changes on your displayed element can be seen directly. Colortables can be removed from the list by pressing the Remove button. (OpendTect Default colortables can not be removed). Moreover, the user can import user-defined colortables by pressing the *Import* button.

Colortable Manager window

The *Colortable Manager* window opens when the user selects the *Manage* option described above.

2.4 颜色表


Manage Color Tables
Add, remove, change color tables
Color table
Status
AI Default
Amplitude clas... Own
Amplitude clas... Own
Blue Own
Brown 4grades Default
CCB Default
Chimney Default
Contour Gradi... Default
Curvature Default
Depth Default
Depth1 Default
DHI Default
Dip Default
Double Rainbow Default
Double Tasty Default
Energy Default
Segmentation None
Undefined color
Transp 100%
Marker color
Remove ...
Import ...
Flip
Save as ...
OK
Cancel
Help

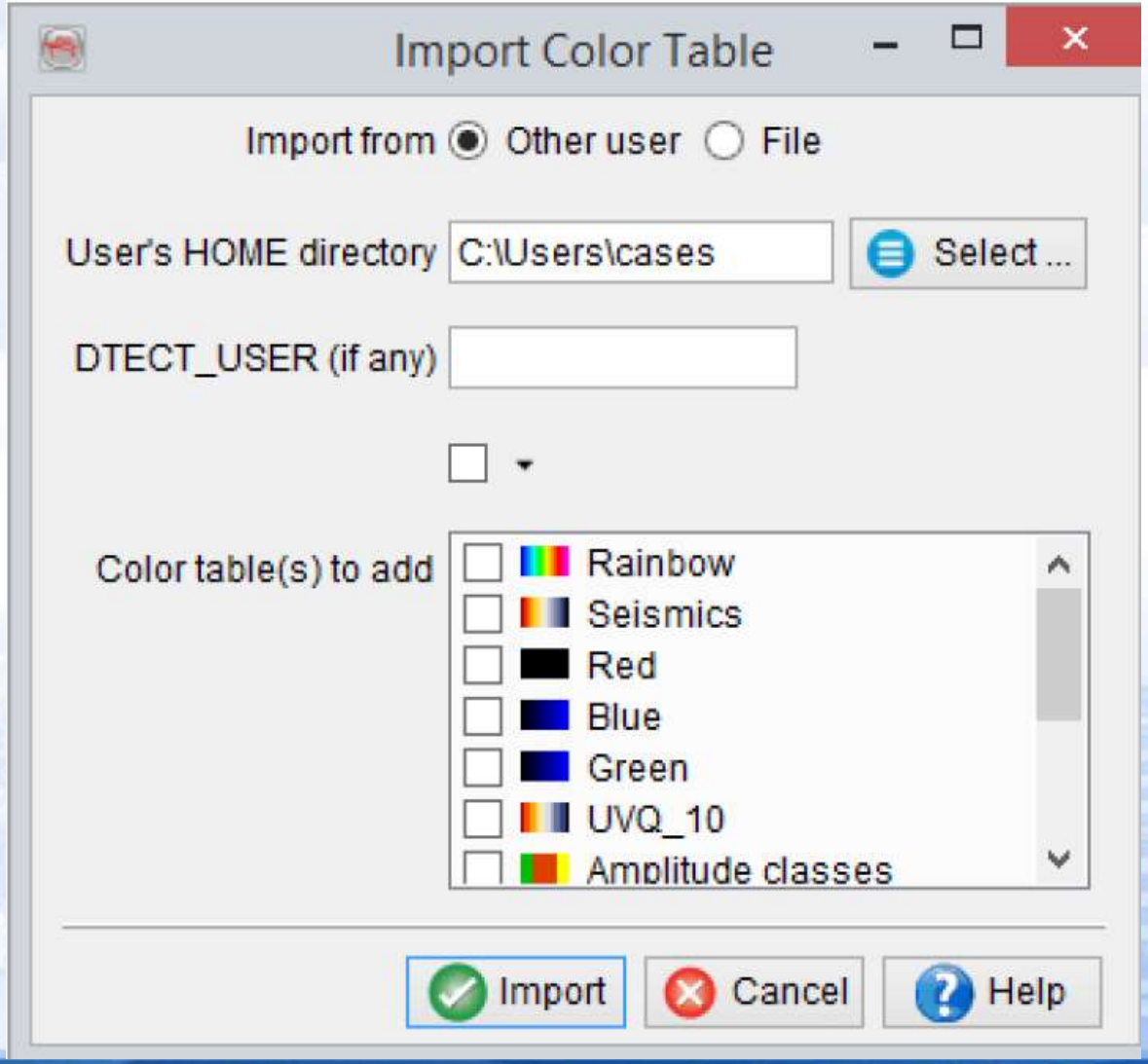
2.4 颜色表

A marker is the color you see in the colorbar. The black lines, in the white field above the colorbar, are the marker boundaries. The marker boundaries are where the settings for the markers are defined. Right-clicking on a marker boundary shows the following options: *Remove color, Change color,* and *Edit Markers*.

Remove color deletes the marker boundary from the colortable.

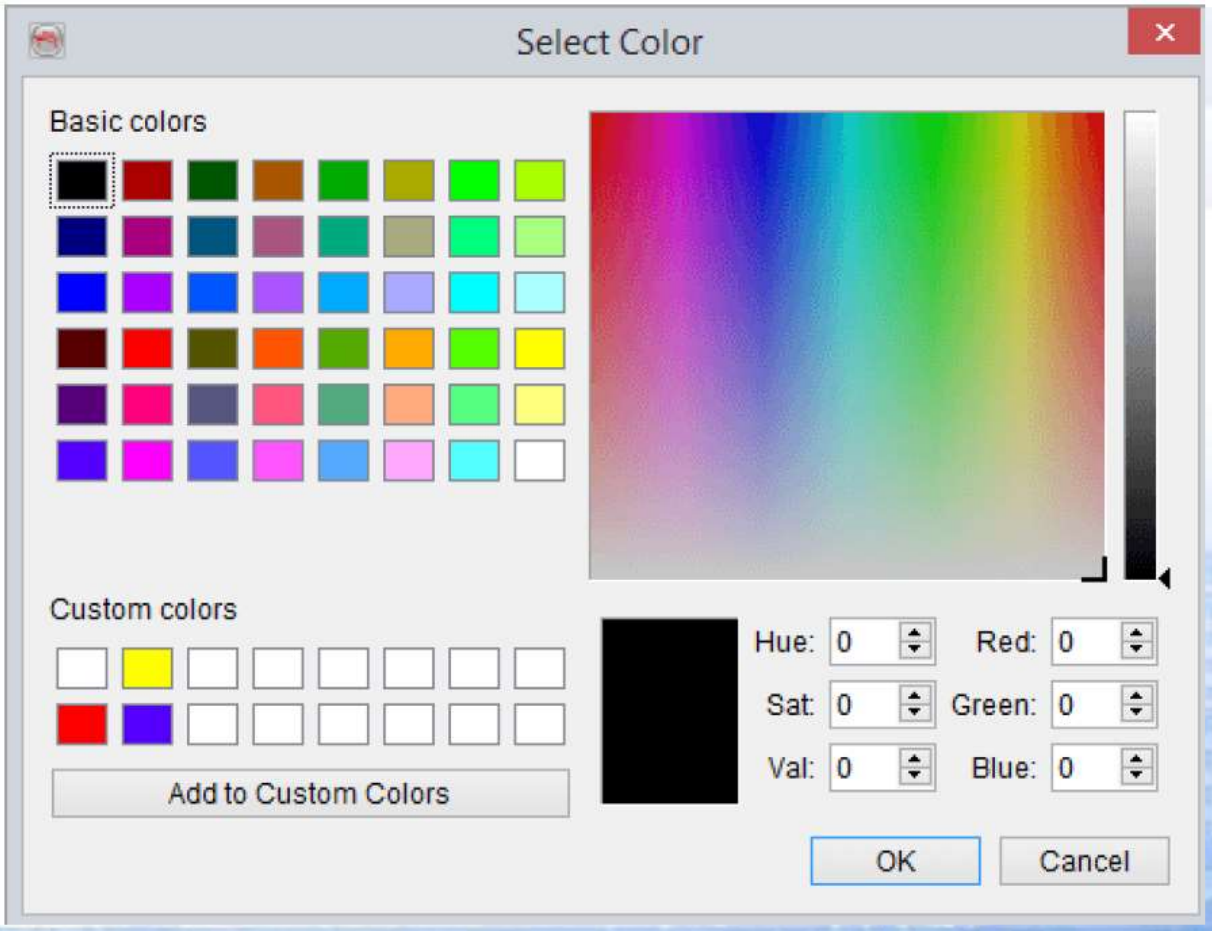
Import colortable file: The colortables can also be imported by pressing the From other user... button. The default colortables are stored in a file (ColoTabs) that is located in the OpendTect installation directory (e.g. /home/your-username/opendtect/ 6.6 .0/data/ or C:\Program Files\OpendTect\ 6.6 .0\data\). Moreover, the colortables saved by a user are stored in a file (settings_coltabs.user) that is located in the user home directory (e.g. $HOME/.od/ or C:\Users\your-username), here user is the OpendTect username. These files can be modified or imported by using import color table window (see below).

2.4 颜色表


Import Color Table
Import from
Other user
File
User's HOME directory
C:\Users\cases
Select ...
DTECT_USER (if any)
Color table(s) to add
Rainbow
Seismics
Red
Blue
Green
UVQ_10
Amplitude classes
Import
Cancel
Help

2.4 颜色表

Marker color brings up a standard color definition window, where this defined color can be changed.



2.4 颜色表

Edit Markers opens the *Manage Marker* window that displays all markers: marker ID, position, and current color. The marker's position, in relation to low and high values, can be specified by number. The standard color definition window can be opened from here too, by double-clicking the marker color.

Opacity: A thin red line, capped on each end by small red nodes, is visible at the bottom of the histogram located in the top panel. By moving these nodes, or adding additional nodes, the user can vary the opacity of the colors below. One can add opacity nodes by double-clicking in this area. These opacity nodes can be dragged up or down to increase or decrease, respectively, the transparency of the color directly below it in the colorbar. A hatched area (visible in the color toolbar in the main window of OpendTect) indicates the part of the color bar that will display with some level of transparency. The darker the color of the hatch marks, the higher the level of transparency.

Transparency performance depends on the graphics card. When displaying two elements in exactly the same position, transparency may not work as you expect. It may help to set transparency values to the maximum to get the sort of display you desire. In addition, it may help to change the transparency of the element as a whole by right-clicking the element in the tree, and selecting Properties.

2.4 颜色表

In the background of the opacity panel, a histogram is shown in light grey. This histogram shows the distribution of attribute values in the selected element. This helps you to tune the colorbar to the value range you may want to highlight. To alter the histogram see *Show Histogram* in the Inline, Crossline & Zslice sub-chapter.

Segmentation allows the user to segment the colorbar into a user-defined discrete number of colors. This can be done in a *Fixed* or *Variable* manner. *Fixed* allows the user to define the number of segments they would like to have, but does not allow the marker boundaries to be moved. *Variable* allows the user to both define the number of segments, and move the marker boundaries to suit specific needs. Fixed is good for purposes such as velocity and contour lines, while *Variable* is good for use with waveform segmentation.

Undefined color specifies the color that will be used to display undefined values in the data.

2.4 颜色表

Color Table Manual Creation

Color tables can be created manually from the color table manager, and can be imported from external files, provided that the relevant format is used.

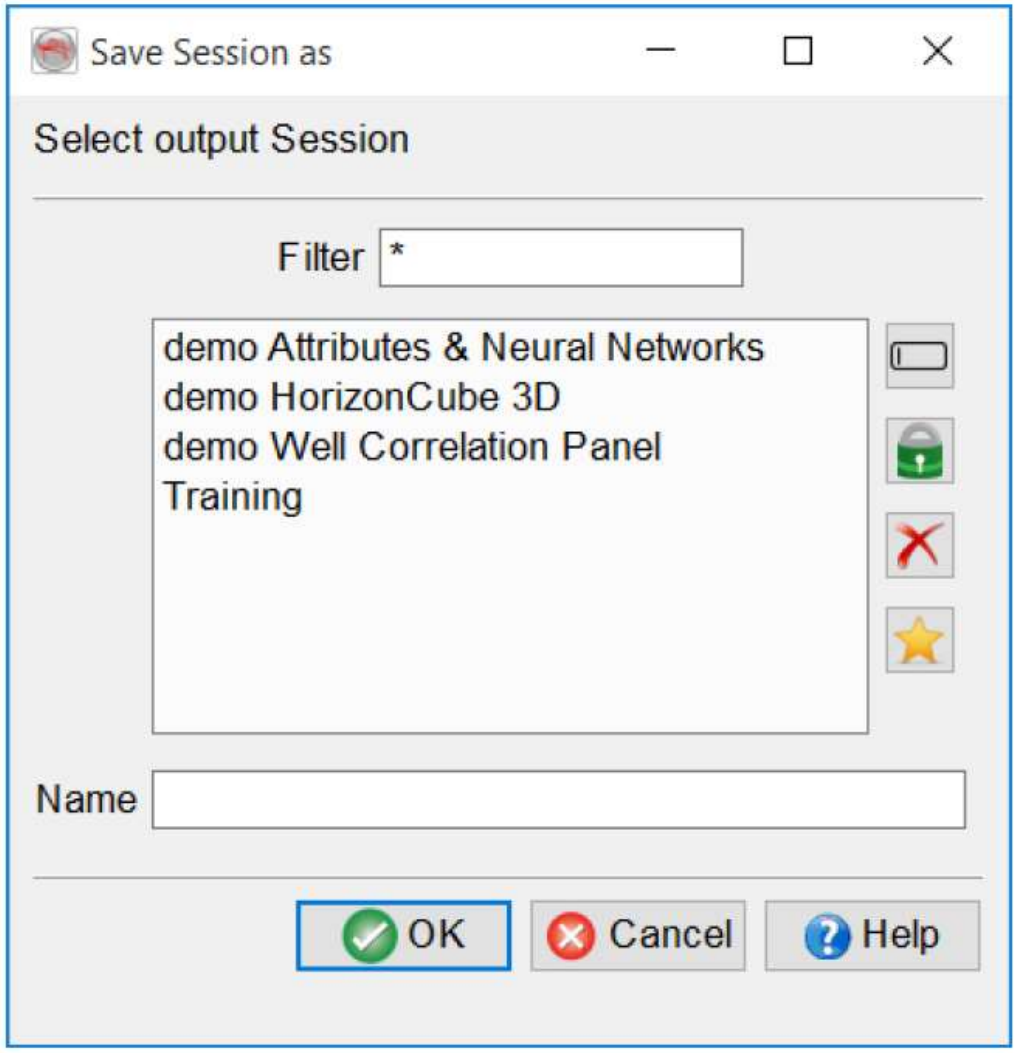
The easiest method by far for adding a new colorbar would be to copy one from the software template: the file *ColTabs* is in the root of the application folder (ie: *C:\Program Files\OpendTect\6.6.0\data* or equivalent). Note that the color tables are discrete, i.e. it is encoded by a fixed number of points for which a color (RGB) and transparency (Alpha) is provided. Values in between are interpolated. It is up to the creator of the color table to decide how many points are needed to correctly represent it.

For one point, each row should be looking like:

XX.Value-Color.YY: POS`Red`Green`Blue`Alpha

where XX is the colorbar index within the file, YY is the sequential point index within a colorbar (0 to N-1), and POS is the relative point position, from 0 (left/bottom) to 1 (right/top).

2.5通用的选择窗口



窗口包含如下的标准按钮：

重命名对象

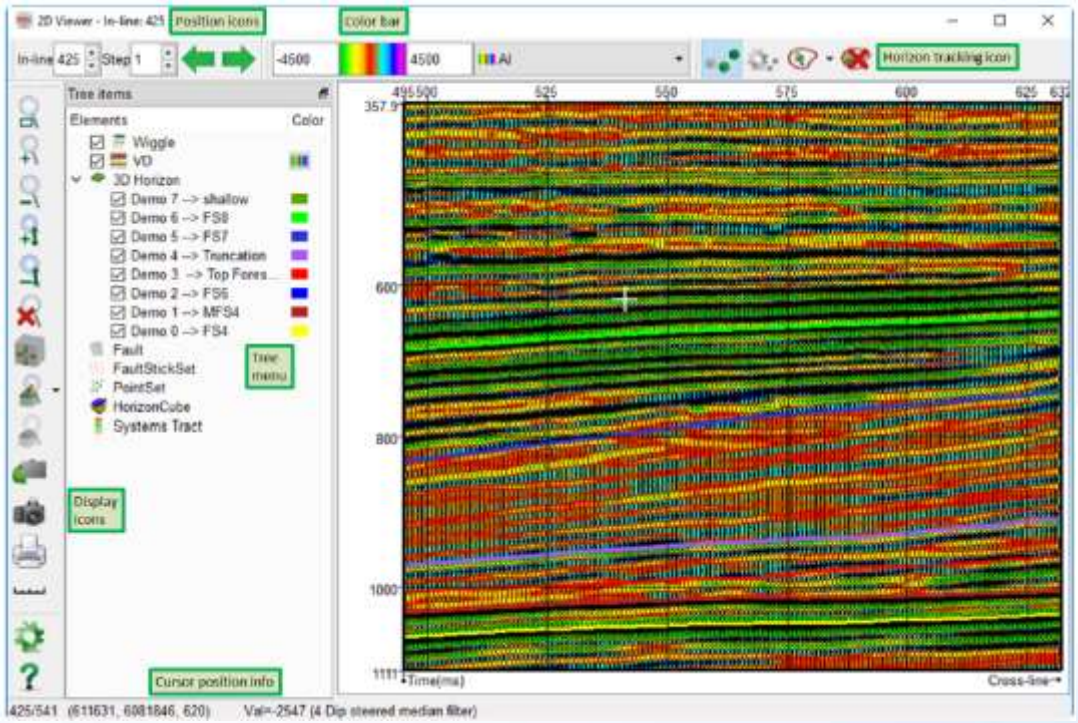
拖拽对象到Read-only

使用这个功能，防止对象被over-writing

删除对象

将选择的对象变成默认对象

2.6 2D 视图



2D Viewer是可视化和解释2D和3D地震数据的视窗。当使用鼠标中间滚轮做Zoom操作时，也可以拖拽对整个剖面做Pan操作。以不同方式启动2D Viewer:

(1) OpendTect主窗口的View菜单，打开2D Viewer

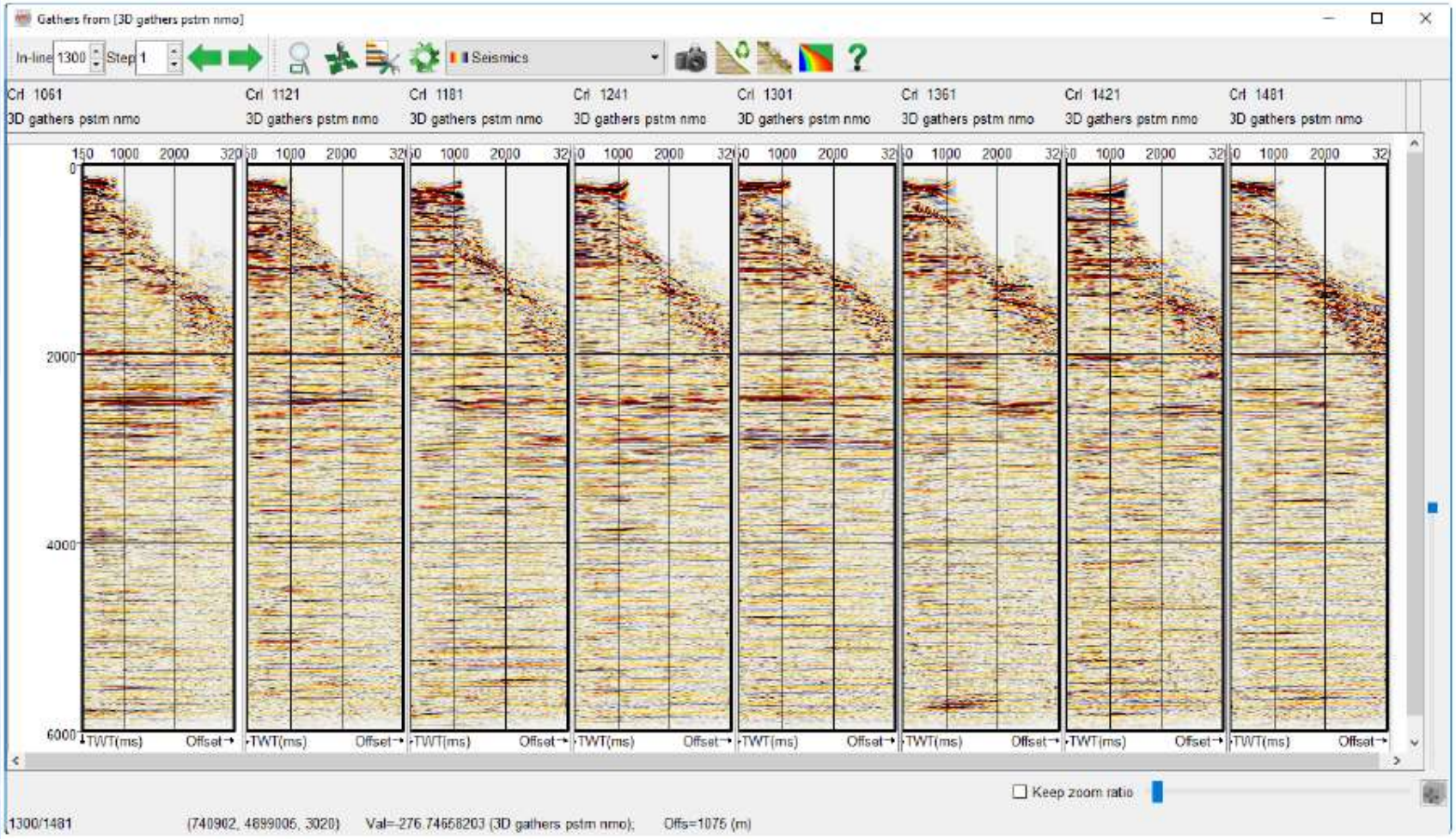
(2) 从变密度  和wiggle  显示按钮，当在3D窗口中选中展示元素时

(3) Basemap工具（仅Pro用户）

2.6.1 Pre-Stack 2D Viewer(叠前地震数据的可视化)

可以同时展示一个或几个叠前地震数据集。在视图中你可以：

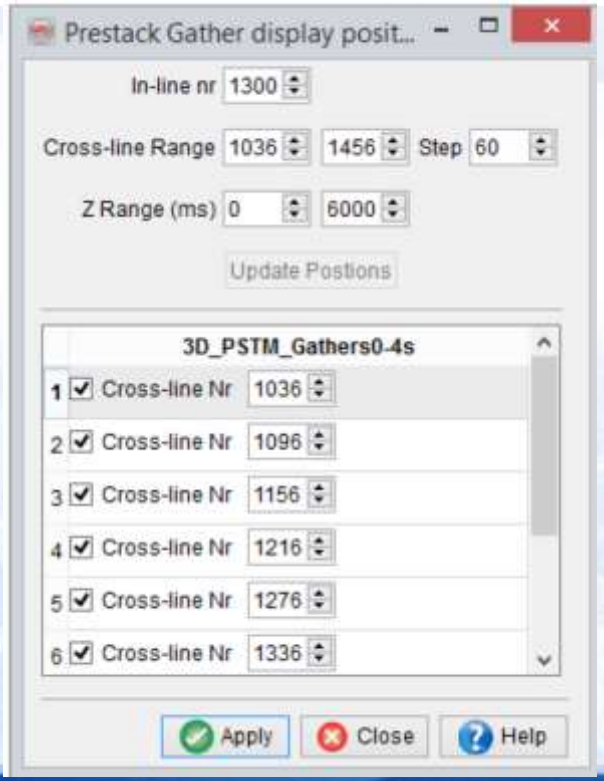
- Display gathers from one datastore at different locations.
- Display gathers from different datastores side by side.
- Use the two modes above in combination.
- Display mute definitions that were either imported or computed before starting the viewer.
- Apply a pre-processing on the gathers: AGC, application of the mute functions (stored or computed on the fly), ...　实施叠前数据集的预处理：AGC, Mute
- Display an angle gather by providing the corresponding velocity model using a stored cube.



Gather, Mute, Angle gather, Velocity model

Gathers position selection

You can set the gathers to be displayed from this window. The top part is used to set a grid of regular positions from provided ranges. Keep in mind that you can get another 2D prestack viewer if you wish to have data from several inlines. From this regular grid, you set the position where gathers should be displayed. You can also manually change a crossline number. Press *Apply* to reload the view.

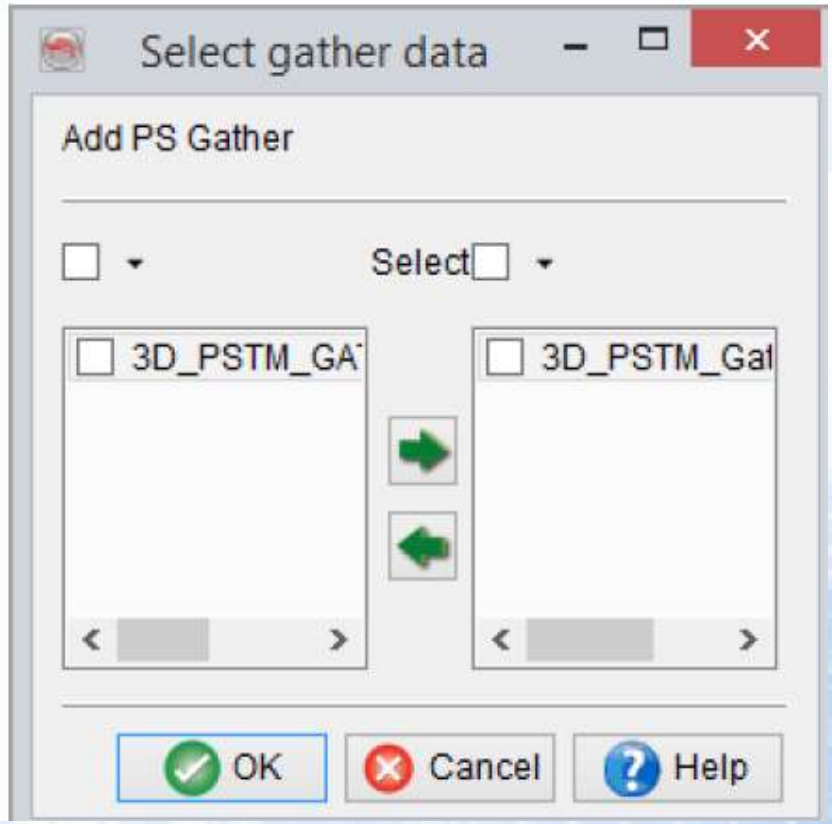


设置展示的gathers

上部分：设置规则位置的网格（一定的区间）

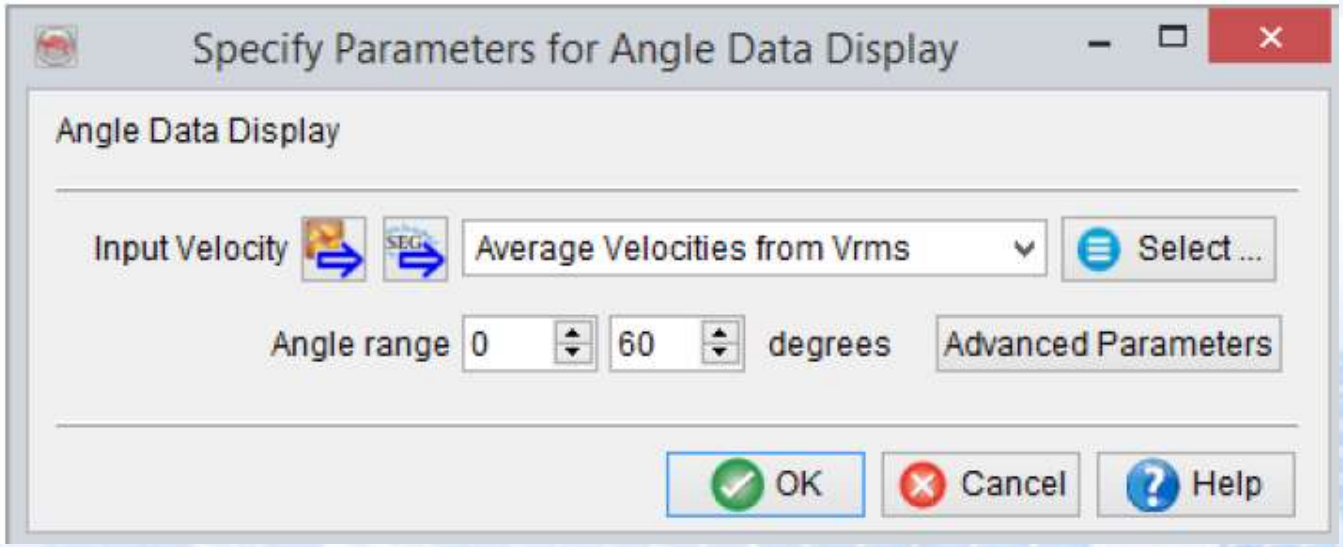
Selection of several datasets

Multiple gathers can also be added together in the 2D panels by pressing this icon.



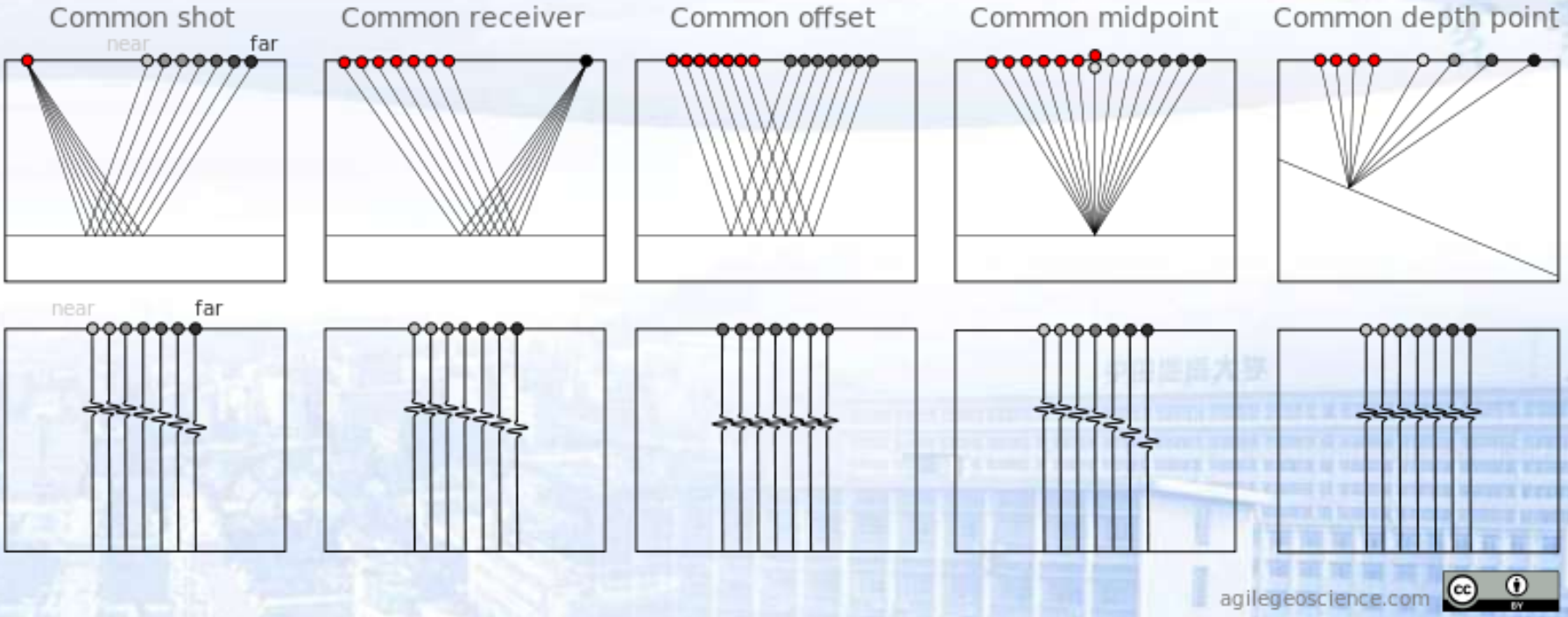
Display of angle gathers

In this window you can set the parameters for creating the angle gather that corresponds to the prestack datastore. For each sample of the input seismic prestack gather, the incidence angle in degrees will be computed and color-coded with the rainbow colorbar. The seismic data will then switch automatically to wiggle display.



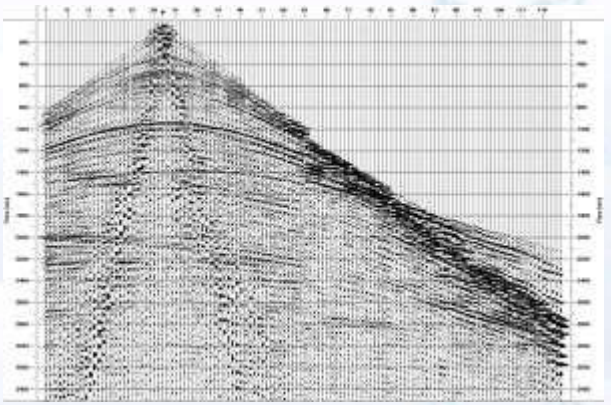
补充知识

Gather


Common shot
near
far
Common receiver
Common offset
Common midpoint
Common depth point
near
far
agilegeoscience.com

Common source or receiver gathers

Basic quality assessment tools in field acquistion. When the traces of the gather come from a single shot and many receivers, it is called a common shot gather (see image). A single receiver with many shots is called a common receiver gather. It is very easy to inspect traces in these displays for bad receivers or bad shots.



common shot gather

Common midpoint gather

The stereotypical gather: traces or sorted by surface geometry to approximate a single reflection point in the earth. Data from several shots and receivers are combined into a single gather. The traces are sorted by offset in order to perform velocity analysis for data processing and hyperbolic moveout correction. Only shot–receiver geometry is required to construct this type of gather.

Common image point gathers

A more sophisticated sorting that takes dipping reflector geometry into account. Not doing so can cause a mis-positioned events, poor imaging, and unfocused reflections. In this case, a priori information about the subsurface, usually a velocity model, must be applied with the shot–receiver geometry in order to construct this type of gather. Common depth point (CDP) is another common term; it's basically synonymous with CIP.

Common offset gather

Used for basic quality control, because it approximates a structural section. Since all the traces are at the same offset, it is also sometimes used in AVO analysis; one can quickly inspect the approximate spatial extent of a candidate AVO anomaly. If the near offset trace is used for each shot, this is called a brute stack.