



4 Survey

4.3.11 Import Seismic Data

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4.3.11 Import Seismic Data

Volumes and 2D Lines can be imported in the Survey menu from files in different modes:

- **SEG-Y:** By converting a SEG-Y file to an OpenText file.
- **SEG-Y scanned:** By referencing (linking) a SEG-Y file to the survey without creating a new file.
- **Simple file:** From a regular ascii or binary file, with or without header.
- **CBVS:** By copying or linking an existing OpenText (CBVS) volume.
- **Petrel:** Import seismic data from other software (depending on system setup)
- **GPR-DZT:** Import the files made by GSSI Ground Penetrating Radar (GPR) systems in the 'DZT' format.



PetrelDirect

GNU版本



导入叠前地震数据

Import SEG-Y Data

Import 3D Prestack Data

Input file *=wildcard E:\Seismics_physics\OpenData\F3_Demo_Start\Seismics\Prestack_seismic.sgy Select ... Edit ...

Coordinate System Anchor: [54.872108,4.83051](617460.88,6082095.00) Select ...

	Full scan result	Source	Actually use
SEG-Y revision	1		Revision 1
Data format	5 - IEEE float (32 bits)		From file header
Number of samples	376 (9538 traces)	From header	376
Z range	0 - 1.5 - 0.004 (s or m)	From header	Start 0 Step 0
In-line range	426 - 426	From header	Inline (byte 189) - "Inl" 4 byte
Cross-line range	700 - 1200	From header	Crossline (byte 193) - 4 byte
X-coordinate range	615604.06 - 628099.19	Calculated	Xcdp (byte 181) - "X" 4 byte
Y-coordinate range	6081982.38 - 6082331.60	Calculated	Ycdp (byte 185) - "Y" 4 byte
Offset range	200 - 2000	In file	offset (byte 37) - "dist" 4 byte
Azimuth range	0 - 0		

Use I/C Use (X,Y)

Coordinate Reference System

ID or name

Select projection

- [EPSG:32631] WGS 84 / UTM zone 31N
- [EPSG:32632] WGS 84 / UTM zone 32N
- [EPSG:32633] WGS 84 / UTM zone 33N
- [EPSG:32634] WGS 84 / UTM zone 34N
- [EPSG:32635] WGS 84 / UTM zone 35N
- [EPSG:32636] WGS 84 / UTM zone 36N
- [EPSG:32637] WGS 84 / UTM zone 37N
- [EPSG:32638] WGS 84 / UTM zone 38N
- [EPSG:32639] WGS 84 / UTM zone 39N

OK Cancel Close




(1) SEG-Y简介

可利用OpendText查看修改seggy文件，供seggyio库使用

- The traces must be sorted either by inlines and then crosslines or by crosslines and then inlines. **sorted**
- The gathers of prestack data must be consecutive and ordered by increasing offset (i.e. no common offset sorting). **Gathers**连续的，增加**offset**的排序
- Inlines/crosslines or coordinates (and offset) must be written in every single trace header. Separate navigation data is only supported for 2D lines.
- The traces must have a fixed length. **固定长度的震道**
- There is no support of extended textual headers.

Once the above criteria are respected, you will then enjoy a large freedom:

- Gaps can be present. **可以填补空白数据**
- The traces can start at any time/depth, even negative.
- The files can be merged during import, re-scaled using linear equations, and the storage format can be changed. **可以合并地震数据，re-scaled，改变存储格式**

 Please, read the entire chapter before asking for support. If you need support, please send us screenshots of each step and (of possible) a scan report together with a detailed description of your problem.

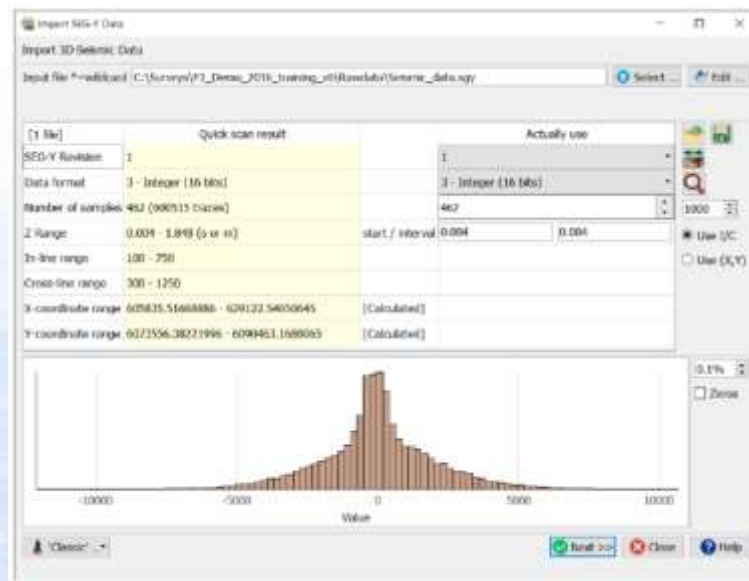
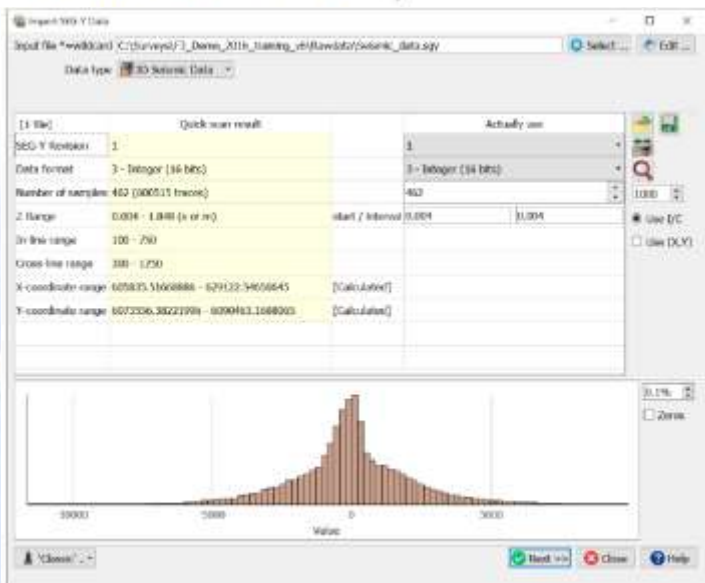


(2) SEG-Y Wizard

可导入一个或多个2D/3D 叠前和叠后数据。

Generic Import SEG-Y Data wizard can be accessed by clicking on **SEG-Y** icon in the toolbar of main OpenTect window. The wizard supports import of 2D and 3D prestack and poststack data from one or multiple SEG-Y files. The layout of this window dynamically changes depending on the user choice of *Data type*.

Data specific wizards are available via *Survey > Import > Seismics > SEG-Y*. The layouts are fixed for the data type selected via the menu (*Data type* option isn't available in these cases).



The generic wizard also supports import of zero-offset VSP.



Input file(s): Select a SEG-Y file to import. In case of importing multiple 2D or 3D SEG-Y files select any of them first and then use the wildcard *.

Import 3D pre- or poststack data from multiple SEG-Y files: files must contain consecutive blocks of inlines and be indexed as *filename_1.sgy*, *filename_2.sgy*...

1. Select one of the files;
2. replace the file index by a wildcard * in the input field: *filepath/filename_*.sgy*

Import multiple 2D lines with pre- or poststack data: files must contain individual 2D lines and be indexed with the respective line names as *filename_linename1.sgy*, *filename_linename2.sgy*...

1. Select one of the files;
2. replace the line name by a wildcard * in the input field: *filepath/filename_*.sgy*;
3. those parts of file names replaced by * are used as 2D line names (press *Next* and see that *Line name* option is greyed out and set to *).

重命名文件名，**filename_*.sgy**




Edit: (optionally) edit text, binary and trace headers of a SEG-Y file in *Manipulate SEG-Y File* window.

Data Type: the choice is only available in the generic *Import SEG-Y Data* window.

- 3D seismic data
- 3D PreStack data
- 2D seismic data
- 2D PreStack data

Table: information required to import a SEG-Y file (therefore the table layout depends on the data type).

- *Quick/Full scan result:* shows results of a quick/full scan of a SEG-Y file:
 - *Quick scan:* a partial scan of SEG-Y is performed upon file selection and after any change of SEG-Y import set-up.
 - *Full scan:* press on  icon to scan the entire file.
- *Actually use:* import parameters as confirmed/overruled by a user.



SEG-Y Revision (default = byte 301 of binary header): please refer to SEG standards for details.

- **SEG-Y Rev. 0:**
 - *Data format, Number of samples, Z Range start/interval* can be overruled.
 - Data positioning (IL/XL, Trace/SP, X/Y and offset): byte locations can be selected by a user.
- **SEG-Y Rev. 1:**
 - *Data format, Number of samples, Z Range start/interval* can be overruled.
 - Data positioning (IL/XL, Trace/SP, X/Y and offset): standard byte locations are used.
- **SEG-Y Rev. 2:**
 - File format options and standard trace header bytes are same as Rev.1.

支持的**SEG-Y**格式的版本

Data format (default = byte 25 of binary header): (optionally) overrule data format.

*Most header values and data samples are written using several bytes for each word/sample. Therefore knowing a correct byte order is a necessity. All SEG-Y standards (Rev. 0, 1 and 2) require using big-endian byte order. Occasionally one can run into data written using little-endian (reverse) one. Using standard SEG-Y data formats for reading such data results in unexpected scanned values of trace headers and unexpectedly large sample values (check the histogram). In this case use data formats with **(byte swapped)** option.*

Number of samples (default = byte 21 of binary header / byte 115 of trace header): (optionally) overrule the number of samples per trace.

Z Range (units = seconds or meters).

SEG-Y文件内容

- **start** (default = bytes 105 *laga* and 109 *delrt* of trace headers): (optionally) overrule start of Z-range (negative start is allowed).
- **interval** (default = byte 17 of binary header / byte 117 of trace header): (optionally) overrule Z-sampling (sampling rate).

OpenTect doesn't support import of a SEG-Y file with varying trace lengths (i.e. Z range start and interval must be constant for all traces in a file).

Data positioning:

Rev.1/Rev.2: trace header byte locations are standard, i.e. can't be selected by a user. If the file is wrongly tagged as Rev.1/Rev.2, over-rule it as 0 in Actually use column in order to be able to select non-standard trace header bytes.

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3D poststack data is loaded based either on Inline/Crossline numbers or X/Y coordinates (see below *Use I/C* and *Use (X, Y)* options).

	Rev.0 defaults	Rev.1 / Rev.2 hard-coded standard bytes
In-line range	9	189
Cross-line range	21	193
X-Coordinate range	73	181
Y-Coordinate range	77	185
Offset range (prestack only)	37	37

2D poststack data is loaded based on trace numbers, reference numbers (SP) and X/Y coordinates.

	Rev.0 defaults	Rev.1 / Rev.2 hard-coded standard bytes
Trace number range	5	5 (can be over-ruled)
Shot-Point number range	197	197
X-Coordinate range	73	181
Y-Coordinate range	77	185
Offset range (prestack only)	37	37

- **Trace number range:** 道号范围
 - *In file*: from a specified trace header byte.
 - *Generate*: generate trace numbers by providing the number of the first trace in a 2D line and step in trace numbers.




Trace number must be unique for each trace along the line, therefore it can be either sequential trace number (byte 5) or CDP trace number (byte 21). A user is always allowed to select a non-standard byte even when the file is Rev.1.


2D and 3D prestack data additionally requires offset information.





- **Offset range**

- *In file*: from a specified trace header byte.
- *From Src/Rcv (X/Y)*: calculate from source and receiver X/Y coordinates (standard byte locations are used: 73 and 77 for source, 81 and 85 for receiver).
- *Generate*: generate offsets by providing the offset of the first trace in a gather and step in offset values.


 **Store this setup**: save a SEG-Y import setup at the survey data root level.

 **Use saved SEG-Y setup**: retrieve one of the stored setups.

 **Scan the entire input**: updates *Quick scan result* with *Full scan result* of the entire input file.

 **Examine input file**: opens *SEG-Y Examiner* window for a specified *Number of traces to examine* (default=1000 traces).

(default = *empty*): (optionally) enter XY scalar to ignore *scalco* (byte 71 of trace header). X/Y coordinates are multiplied by this factor.

 *Note that scalco is the scale factor for all coordinate bytes with value plus or minus 10 to the power 0, 1, 2, 3, or 4 (if positive, multiply, if negative divide).*

Histogram: displays a distribution of amplitudes after *Quick* (partial) or *Full* scan.

- *Percentage clip for display* (default=0.1%): amount of data in the histogram tails excluded from the plot.
- *Zeros* (default=unchecked): allows to include/exclude value 0 for histogram display.





Data specific options: 数据相关的选项:

3D (pre- and poststack) data positioning can be based either on Inline/Crossline or X/Y coordinates of each trace:

- **Use I/C** (default): positioning of imported data is based on Inline/Crossline numbers, (X,Y) coordinates are therefore calculated from a survey setup.
- **Use (X,Y)**: positioning of imported data is based on (X,Y) coordinates, Inline/Crossline numbers are therefore calculated from a survey setup. If Coordinate Reference System (CRS) is defined for the survey, CRS conversion will be available in the import window.

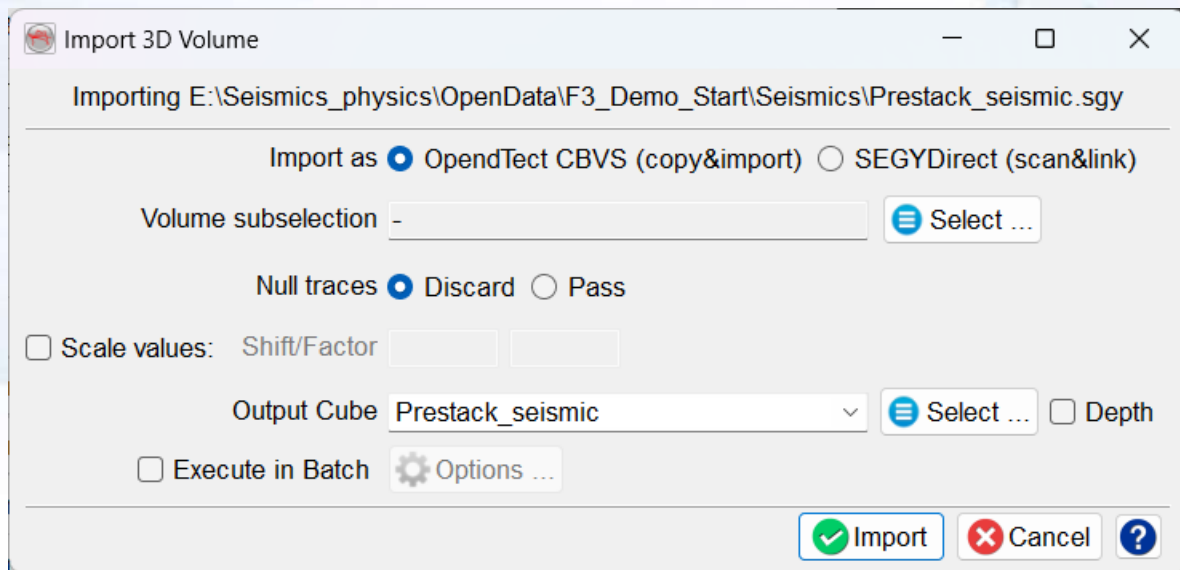
2D (pre- and poststack) data Z-range can vary per SEG-Y file if multiple lines of different vintages are imported at the same time:

- **File Z's** (available only when multiple 2D lines are imported): if checked, *Z Rangestart/interval* and *Number of samples* are used as they appear in each SEG-Y file.


💡 *Overruling of Z Range start/interval and Number of samples is possible only if File Z's is unchecked.*



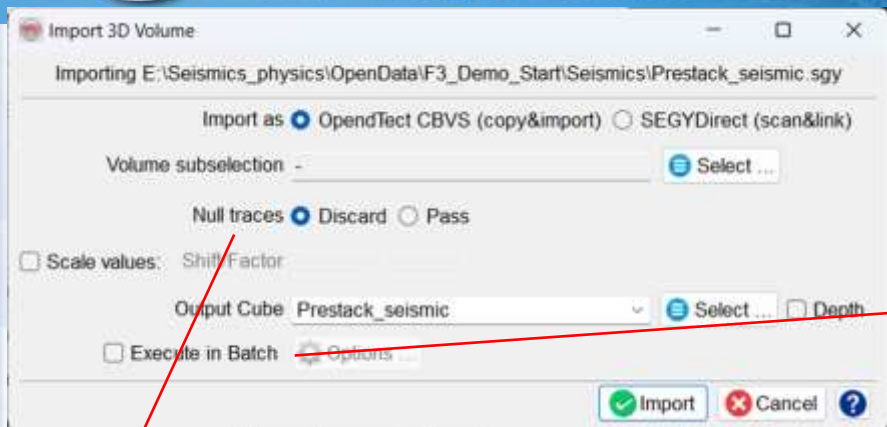
Import Window



Copy data:

- **Yes (import):** 导入后，转成CBVS格式
 - data is imported to CBVS format (internal OpendText format for seismic data);
- **No (scan and link):**
 - link to a SEG-Y file, i.e. no data duplication;
 - if a SEG-Y file is moved or renamed outside OpendText, the link can be restored via  icon in *Manage 3D Seismics* window;
 - performance for prestack data may be lower than with OpendText CBVS prestack datastore.

Volume Subselection (default= '-', i.e. *All*): (optionally) a sub-set or a decimated volume can be imported.



- **PetrelDirect**: write directly to Petrel datastore with a PetrelDirect link to it in OpendTect.

Depth/Time: (optionally) depth volumes can be imported to time surveys by checking this box and vice versa.



They can be visualized using transformed scenes, providing that velocities are available.

- **Execute in Batch**: (optionally) import can be done in a single-machine batch mode.



It is a good practice to display 3D seismic data on a z-slice after import to check for any gaps or null traces.

Null traces:

- **Discard** (default): null traces are discarded, i.e. shown as undefined.
- **Pass**: null traces are imported with amplitude values of 0.

Scale values (default=off): (optionally) shift and scale amplitude values:

- **Shift**: add this shift to sample amplitudes.
- **Factor**: multiply sample amplitudes by this factor.

Output Cube: type in a cube name to be used in the OpendTect project and choose its format:

- **CBVS**: internal OpendTect format for seismic data.
- **SEG-YDirect**: link to a SEG-Y file.



Import 2D Line(s) / Import Line 2D Pre-Stack(s)

Import 2D Line

Importing C:\Surveys\F3_Demo_2016_training_v6\Rawdata\Seismic_data.sgy

Copy data ☒ Yes (import) ☐ No (scan&link)

Line name Seismic_data

Trace subselection - Select ...

Null traces ☒ Discard ☐ Pass

☐ Scale values: Shift/Factor

Coordinate source The trace headers

Output 2D Data (attribute) Select ... ☐ Depth

☐ Execute in Batch Options ...

✓ Import ✗ Cancel ? Help

当设置为2D Survey时才有此功能



Line name:

- Single 2D line: either type in a new line name or select one of the existing ones.
- Multiple 2D lines: the field is greyed out, and line names come from parts of file names replaced by a wildcard *.

Trace Subselection (default= '-', i.e. *All*): (optionally) a sub-set or a decimated volume can be imported.

Null traces:

- *Discard* (default): null traces are discarded, i.e. shown as undefined.
- *Pass*: null traces are imported with amplitude values of 0.

Scale values (default=off): (optionally) shift and scale amplitude values

- *Shift*: add this shift to sample amplitudes.
- *Factor*: multiply sample amplitudes by this factor.

Coordinate source (default=The trace headers):

- *The trace headers*: use trace headers as specified in *import SEG-Y Data* wizard.
- *A 'Nr X Y' file (bend=points needed)*: (optionally) the coordinates can be specified using an auxiliary navigation file. The format should be an ascii file with one position per line in a fixed column format without header: trace number, X and Y coordinates. Units to be used are the same as specified in the survey definition
 - Single 2D line: select a file containing a navigation survey.
 - Multiple 2D lines: navigation files must have same names as corresponding SEG-Y files and different extension (such as .crd).
- *Generate straight line*: manually enter X/Y coordinates of the first trace and regular steps in X/Y directions. Units to be used are the same as specified in the survey definition.

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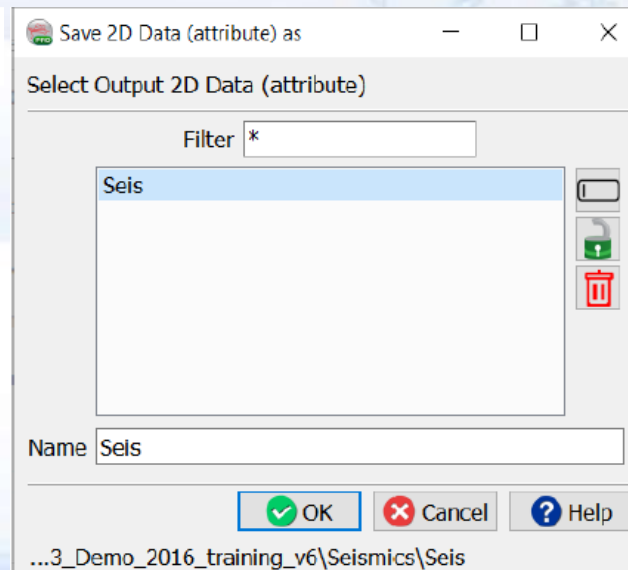
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Output 2D Data (attribute): type in a 2D dataset name to be used in an OpendTect project and choose its format:

- *CBVS*: internal OpendTect format for seismic data.
- *PetrelDirect*: write directly to Petrel datastore with a PetrelDirect link to it in OpendTect.


Optionally press *Select* to see the list of existing 2D data in a project:





2 Classic SEG-Y Import Tool

The *Classic SEG-Y Import Tool* used to be the main utility for import of SEG-Y data prior to *OpendTect 6.0*. This wizard can still be launched via:

- *Survey > Import > Seismics > SEG-Y > Classic tool*;
- from the *SEG-Y Wizard* introduced in *OpendTect 6.0* by clicking on  **'Classic'**.

It allows to import 2D and 3D pre- and poststack seismic data from one or multiple SEG-Y files. The import consists of two mandatory steps: SEG-Y Import Preparation and SEG-Y Import itself.

OpendTect-6.6 GNU版本软件，已经没有此功能了！



4.3.11.2 SEG-Y Scanned

没有看到此功能？

Data duplication is a large problem when working with large datasets. All other import tool generate new OpendTect files from ascii or binary files. This new type of *SEG-Y import* works differently since it will not create any file but will link an existing SEG-Y file to an OpendTect entry, selectable as any other OpendTect data.

This special *import tool* is only available for both stacked and prestack data. However, it should be noted that for prestack data the performances for reading and processing may be lower than with OpendTect prestack datastores that are optimized by importing the usual way. The importation itself is 100% similar to the normal SEG-Y import. The only difference is that there will not be any loading after completing the wizard.

Please note that since this tool links to an existing file, moving or renaming the file outside OpendTect will break the link and make the dataset unavailable.



4.3.11.3 Simple File

The user can import simple ASCII or Binary file by using plain file Seismic I/O Plugin. This can be reached via *Survey > Import > Seismic > Simple File > 3D or 2D (Pre/Poststack) etc.*

The input file must first be selected and its data format type specified, between ascii and binary (4-bytes floats). All data must be in the 'local' format, because a blunt binary read/write is performed.

(Part of) the input file can be visualized by pressing the examine button. The data must consists of **one trace per record** (line). The samples are thus in columns, from shallowest to deepest, with a regular step. The trace position and time/depth index can be read from the input file, left of the trace, or can be provided. If provided, start, step and number of samples are requested in the corresponding directions, assuming the input file if regular and does not contain holes. Poststack volume must be sorted by inlines, crossline, (offset), Z (time or depth).

Optionally, the user can scale the cube before loading as well by mentioning the amount of shift and the corresponding factor. Either *pass* or *discard* the null traces before loading.



4.3.11.3 Simple File

The easiest way to see what the format looks like is by producing a little export file from a bit of seismics. In the example below we exported inlines 500-501 and cross-lines 600-603, Z range 1000-1020 step 4 (which is 6 samples):

- 1000 4 6
- 500 600 1456 -688 -1502 4955 8935 1209
- 500 601 1429 -640 -967 5248 8362 527
- 500 602 1353 -424 -1040 5071 8059 -64
- 500 603 1428 -587 -1244 5139 8447 13
- 501 600 1450 -411 -1414 4792 8449 1117
- 501 601 1619 -456 -1243 4695 8271 702
- 501 602 1617 -213 -1272 4675 7903 393
- 501 603 1552 -248 -1088 4875 8004 204



Below are respective examples of the import for 3D poststack, 2D poststack, 3D prestack, 2D prestack:

Import 3D Seismics from simple flat file

File type: ☒ ASCII ☐ Binary

Input file: [Select...] [Examine]

Traces start with a position: ☒ Yes ☐ No

Position in file is: ☐ X,Y ☒ Int Col

File start contains sampling info: ☐ Yes ☒ No

Sampling info: start, step (ms) and #samples: 0 4 463

☐ Scale values: ShiftFactor

Null traces: ☒ Discard ☐ Pass

Output Cube: [Select...] CBVS ☐ Depth

[Import] [Cancel] [Help]

Import 3D Seismics from simple flat file

File type: ☒ ASCII ☐ Binary

Input file: [Select...] [Examine]

Traces start with a position: ☒ Yes ☐ No

Position in file is: ☐ X,Y ☒ Int Col

File start contains sampling info: ☐ Yes ☒ No

Sampling info: start, step (ms) and #samples: 0 4 463

☐ Scale values: ShiftFactor

Null traces: ☒ Discard ☐ Pass

Output Cube: [Select...] CBVS ☐ Depth

[Import] [Cancel] [Help]

Import 2D Seismics from simple flat file

File type: ☒ ASCII ☐ Binary

Input file: [Select...] [Examine]

Traces start with a position: ☒ Yes ☐ No

Trace number included (preceding X,Y): ☐ Yes ☒ No

Trace number definition: start, step 1 1

File start contains sampling info: ☐ Yes ☒ No

Sampling info: start, step (ms) and #samples: 0 4 463

☐ Scale values: ShiftFactor

Null traces: ☒ Discard ☐ Pass

Output 2D Data (attribute): [Select...] ☐ Depth

Line name:

[Import] [Cancel] [Help]

Import 3D Prestack Seismics from simple flat file

File type: ☒ ASCII ☐ Binary

Input file: [Select...] [Examine]

Traces start with a position: ☒ Yes ☐ No

Position in file is: ☐ X,Y ☒ Int Col

Position includes: ☐ Offset ☐ Azimuth

Offset definition: start, step, 0 225 25

File start contains sampling info: ☐ Yes ☒ No

Sampling info: start, step (ms) and #samples: 0 4 463

☐ Scale values: ShiftFactor

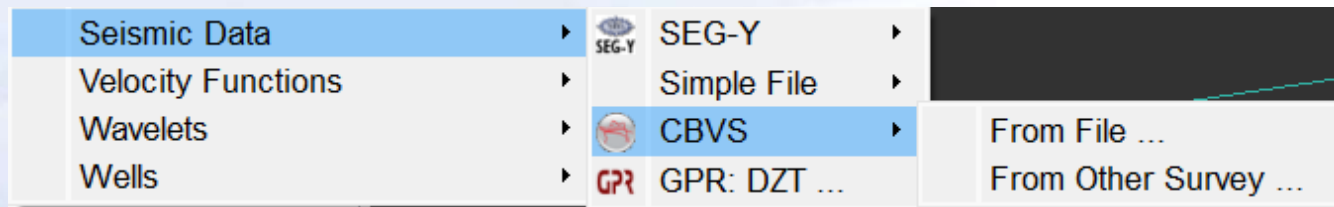
Null traces: ☒ Discard ☐ Pass

Output Pre-Stack 3D Data: [Select...]

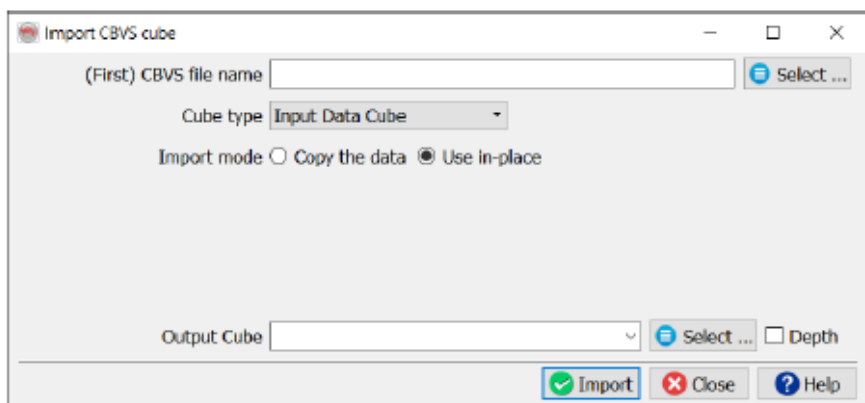
[Import] [Cancel] [Help]



4.3.11.4 Import CBVS Cube

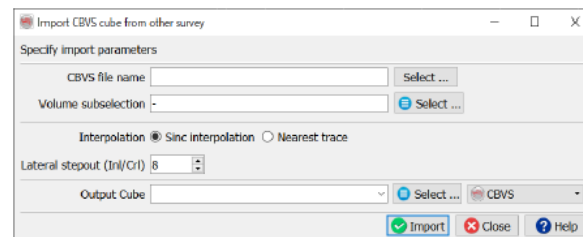


From file



From other survey(s)

Seismic cubes in cbvs format can also be imported from other survey(s)



From Other Survey ...

Few changes can be made prior to import the file: The volume subselection, the type of interpolation (sinc interpolation or nearest trace) and the stepout in inline and crossline.



From File

This module enables exchange of data between the OpendTect projects. The original CBVS (Common Binary Volume Storage) file can be located with a standard file browser. Some CBVS volumes are stored in several sub files. These can be recognized by the ^01 or ^02 (etc.) in the filename. To import the complete volume, select the base file without any ^xx marks.

The *Cube type* needs to be specified in order to give it the correct label for the software.

The *Import mode* indicates if the file should only be left at its original place and just be linked to the current survey (*Use in-place*), or if the volume should be copied entirely into the current survey directory (*Copy the data*). Moreover, while importing, the volume can be sub-selected (selected inlines/crosslines/time ranges) by pressing *Select* button in front of the *Volume subselection* field. If the data contains the Null traces, either discard or pass the traces by selecting the respective radio button. Before, importing the CBVS volume, the scaling (16bit, 32 bit etc) can be applied to the volume. The *Output Cube* field corresponds to the output volume name (that will be available in Manage Seismic window) for the input file.



4.3.11.5 GPR-DTZ

导入穿地雷达的勘探数据

Ground penetrating radar offers an accurate solution to mapping the subsurface of the earth. It locates features of interest and subsurface layers in real time. The GPR data visualization and interpretation can be made in OpendTect, which enables the user to import the files made by GSSI Ground Penetrating Radar (GPR) systems in the 'DZT' format. The result is a 2D line in OpendTect.

Prior to loading a GPR data, the 2D survey should be setup according to the GPR acquisition setup. The data files are then imported as 2D geometries. The following *Import GPR Seismics* window allows the user to select one line and import the line according to the given setup. The time stamps or sampling rate in OpendTect is defined in milli-seconds. However, the DZT files are often sampled with nano-seconds sampling rate. To adjusted this, there is an input field available i.e. 'Z factor' that allows re-scaling of Z-axis or time. In order to visualize the data in OpendTect, this factor should be large enough. The remaining parameters i.e. Start X,Y position or X/Y steps could be filled according to the profile location.



Import GPR-DZT Seismics

Input DZT file



Select...

Trace number definition: start, step

Start position (X,Y)

Step in X/Y

Z Factor

Output Line name

Output 2D Data (attribute)



Select...



Import



Cancel



Help



4.3.11.6 Tagged Seismic Data

尚未看到此功能

The imported volumes may contain any data. However several types can be specified during import and/or after:

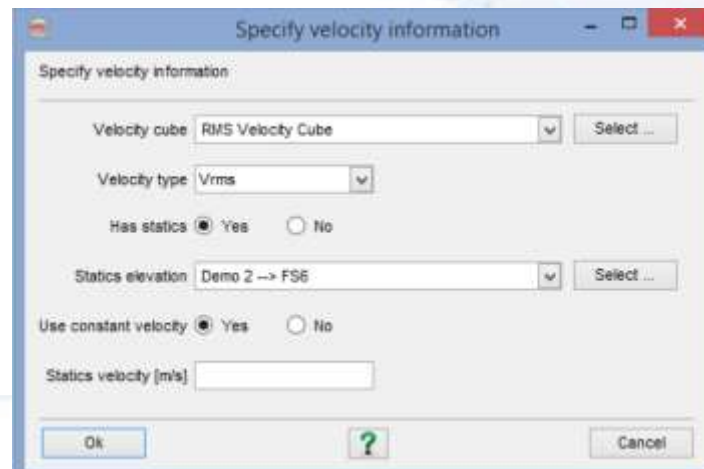
- Depth poststack volumes/lines loaded in time surveys. A check box must be toggled on during SEG-Y or simple file import.
- Time poststack volumes/lines loaded in depth surveys. A check box must be toggled on during SEG-Y or simple file import.
- Velocity/anisotropy volumes must be tagged with respect to their type, when imported from an external file. The available types are:
 - Vint: Interval velocity
 - Vrms: RMS velocities (time domain only). A provided surface may provide elevation statics in meters. For time surveys a statics velocity must be provided in m/s, either from a velocity grid or using a constant velocity.
 - Vavg: Defined as the ratio between the depth and the travel time: $V_{avg}(TWT) = 2 \cdot Z / TWT = Z / OWT$.
 - Delta: Thomsen anisotropy parameter of the same name.
 - Epsilon: Thomsen anisotropy parameter of the same name.
 - Eta: Effective anisotropy parameter, combine from delta and epsilon. This tag can also be used to grid another quantity (the software does not actually check that eta values are input).



The assignment of velocity types (and properties) to a volume is called velocity edition. This window can be opened in most windows wherever velocity volumes are used (an exception is the attribute set window):

- Volume gridding
- Time-to-depth scenes
- Time-to-depth conversions
- Velocity conversions

Application of velocity corrections on prestack gathers



The velocity volumes may be scanned to get the Vavg range at their first and last sample. This allows the software to deduct and propose appropriate time/depth ranges during conversions (on-the-fly and batch).