Introduction to the 3D-datainterpretation within REFLEXW

In the following the 3D-datainterpretation of REFLEXW is described including the generation of a 3D-dataset (Chap. I), the processing of 3D-datafiles (chap. II) and the interpretation of 3D-datafiles (chap. III).
Please use in addition to this guide the instructions within the corresponding chapters of this manual and the online help.

I. generation of a 3D-dataset

A **3D-data file** is a single REFLEX formatted file which consists of several equidistant 2D-lines sequentially stored. All traces belonging to one 2D-line have the same ensemble-number which is stored within the REFLEXW traceheader. The direction (x or y) within the fileheader determines the direction of the 2D-lines.

Depending on the original data there are several ways to generate a 3D-file in ReflexW format:

generate 3D-file without an interpolation:

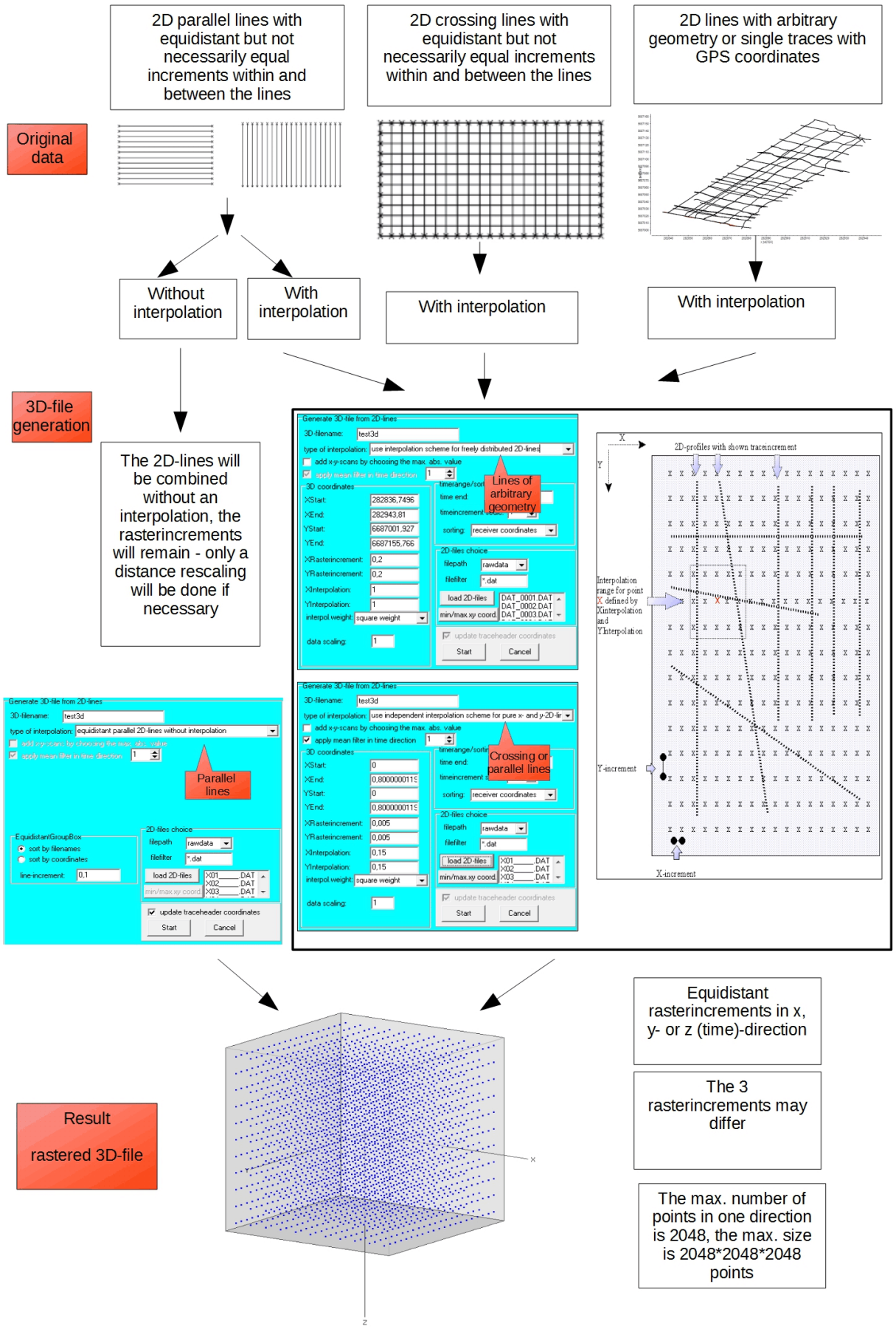
Precondition is that the original data have been acquired along **parallel equidistant 2D-lines**. If this is true the 3D-file may be generated
- from original 2D- or 3D-data during the import (chap. I.1.1). In this case the complete dataprocessing is done for the 3D-datafile (see chap. II).
- from REFLEXW formatted 2D-lines (chap. I.1.2). The 2D-lines may be raw data (then the processing is done for the 3D-datafile) or already processed data. There are no general rules whether the processing shall be done for the 3D-datafile or for the individual 2D-lines.

The rasterincrements of the resulting 3D-datafile will not be changed.

generate 3D-file with interpolation:

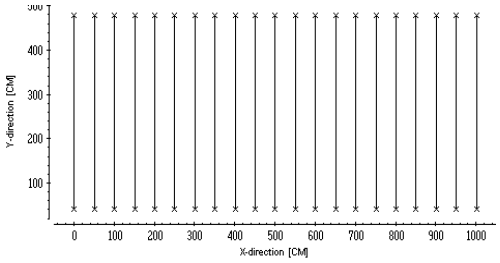
The 3D-datafile may be constructed from Reflexw formatted **parallel 2D lines**, **crossing 2D lines** (chap. I.2.1) or from **freely distributed lines** using e.g. GPS based coordinates (chap. I.2.2).
The rasterincrements of the resulting 3D-datafile may be freely entered.

In both cases, the data points of the resulting 3D-file have fixed increments in x-, y- and time-direction, respectively, and the max. size of the 3D-file is limited to 2048 points in each direction. The resulting 3D-datafile has the same REFLEXW format like a 2D-datafile (the ensemble number within the traceheader controls the sequential storing) and it therefore may be processed within the 2D-dataanalysis module (chap. 0.9.2) whereby the interpretation must be done within the 3D-datainterpretation (chap. 0.9.3).


2D parallel lines with equidistant but not necessarily equal increments within and between the lines
2D crossing lines with equidistant but not necessarily equal increments within and between the lines
2D lines with arbitrary geometry or single traces with GPS coordinates
Original data
Without interpolation
With interpolation
With interpolation
With interpolation
3D-file generation
The 2D-lines will be combined without an interpolation, the rasterincrements will remain - only a distance rescaling will be done if necessary
Lines of arbitrary geometry
Crossing or parallel lines
Parallel lines
2D-profiles with shown traceincrement
Interpolation range for point X defined by Xinterpolation and Yinterpolation
Y-increment
X-increment
Result
rastered 3D-file
Equidistant rasterincrements in x, y- or z (time)-direction
The 3 rasterincrements may differ
The max. number of points in one direction is 2048, the max. size is 2048*2048*2048 points

I.1 Generating a 3D-file without interpolation

A 3D-file without interpolation may be generated from original 2D- or 3D-data during the import (chap. 0.9.1.1.1) or from REFLEXW formatted 2D-lines (chap. 0.9.1.1.2). In both cases the original data are parallel 2D-lines with equidistant profile increment orientated either in x- or y-direction.



I.1.1 Generating a 3D-file from during the import from parallel 2D-lines

The original data are parallel 2D-lines which are either stored as separate 2D-files or stored within one single file including all 2D-lines.

A. original parallel 2D-lines stored as separate files

The precondition is that the original data are:
- parallel 2D-lines with a fixed profileincrement (increment between the different 2D-lines) and identical startcoordinate
- fixed traceincrement
- fixed timeincrement
- same number of points per trace (identical timerange)
- same number of traces per 2D-line (identical distancerange)

Then a 3D-datafile may be easily constructed during the import by simply storing sequentially the different 2D-lines within one file. The size of the 3D-cube is determined from the number of 2D-lines, the number of traces per 2D-line and the number of points in timedirection. Example: 21 different 2D-lines with 200 traces per 2D-line (profiledirection: y) and 256 points per trace: xpoints: 21, ypoints: 200, zpoints (timepoints): 256.

In the following the individual steps for creating such a 3D-file are described in detail:

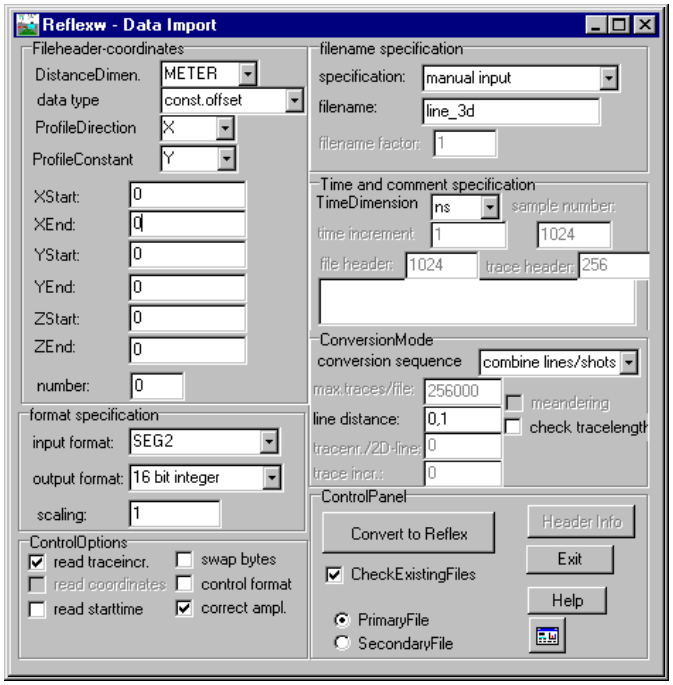
1. enter the module **2D-dataanalysis**

2. activate the option **file/import**

3. choose the following options within the **import menu**:

<u>data type</u>: const. offset (version 2) or 3D-const.offset (from version 3)
<u>ProfileDirection:</u> direction of the original 2D-lines (enter either x or y)
<u>ProfileConstant:</u> constant coordinate direction of the original 2D-lines (enter either y or x depending on the chosen profile direction)
<u>xstart:</u> start coordinate in x-direction
<u>ystart:</u> start coordinate in y-direction
xend, yend, zstart, zend: not necessary to input

outputformat: 16 bit integer (e.g. for GPR-data) or 32 bit floating point for a higher data resolution (e.g. for seismic data).
To be considered for SEGY or SEG2-data: the option swap bytes controls if the original data originate from UNIX (activate option) or DOS-machines (deactivate option). If the conversion fails try to change this parameter.
filename specification: manual input
filename: any name (e.g. line_3d)
TimeDimension: ns (GPR data) or ms (seismic data)
conversion sequence: combine lines/shots
linedistance: enter the distance between the individual parallel 2D-lines



4. activate the option **Convert To Reflex**: the wanted shots must be chosen and they are automatically combined into one single datafile containing all the shots.

There are 2 different possibilities of choosing the datafiles:

a.. choose the datafiles from the openfile dialog (multiple choice using the shift or str-key) : all chosen original data files are sorted with ascending order. Problems may occur if the files don't have the same length (e.g. file1, file2,..., file11). In this case a warning message appears.

b. open an external ASCII-filelist with the extension "lst": the external filelist contains all wanted datafiles in an arbitrary order (one row contains one filename). The datafiles must be stored under the same path like the ASCII-filelist. Example:
TEST__02.sg2
TEST__01.sg2

After having chosen all the wanted datafiles the combined 3D-datafile is displayed using the current plot settings.

B. original parallel 2D-lines stored as one single 3D-datafile

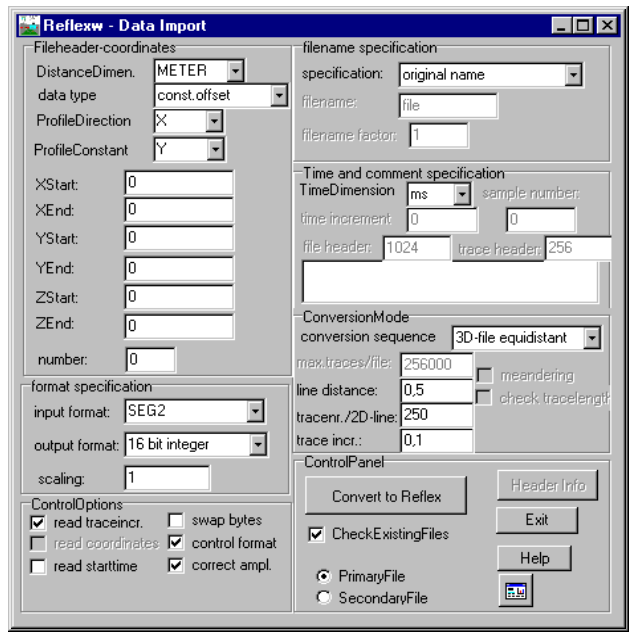
In this case it is is assumend that the original profile is a 3D-file consisting of parallel 2D-lines with:
- equidistant trace increment
- equal trace number for each 2D-line
- identical start coordinate for each 2D-line
- equidistant distance between the individual 2D-lines.

In the following the individual steps for creating such a 3D-file are described in detail:

1. enter the module **2D-dataanalysis**

2. activate the option **file/import**

3. choose the following options within the **import menu**:



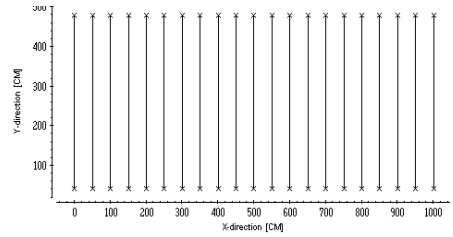
<u>data type</u>: const. offset (version 2) or 3D-const.offset (from version 3)
<u>ProfileDirection:</u> direction of the original 2D-lines (enter either x or y)
<u>ProfileConstant:</u> constant coordinate direction of the original 2D-lines (enter either y or x depending on the chosen profile direction)
<u>xstart:</u> start coordinate in x-direction
<u>ystart:</u> start coordinate in y-direction
xend, yend, zstart, zend: not necessary to input
<u>outputformat</u>: 16 bit integer (e.g. for GPR-data) or 32 bit floating point for a higher data resolution (e.g. for seismic data).
To be considered for SEGY or SEG2-data: the option <u>swap bytes</u> controls if the original data originate from UNIX (activate option) or DOS-machines (deactivate option). If the conversion fails try to change this parameter.
<u>filename specification</u>: original name
<u>TimeDimension</u>: ns (GPR data) or ms (seismic data)
<u>conversion sequence</u>: 3D-file equidistant
<u>linedistance:</u> enter the distance between the individual parallel 2D-lines
<u>tracenr./2D-line:</u> enter the number of traces for each 2D-lines containing within the 3D-file
<u>traceincr.:</u> enter the increment between the traces within each 2D-line

4. activate the option **Convert To Reflex**: the wanted original 3D-file must be chosen. The data within the resulting REFLEXW 3D-datafile are stored in the same manner like the original data but the ensemble number which controls the different 2D-lines is set based on the entered tracenr./2D-line.

I.1.2 Generating a 3D-file from Reflexw formatted parallel 2D-lines

The preconditions for generating a 3D-file within the 3D-datainterpretation without interpolation are REFLEX formatted 2D-lines with:

- parallel 2D-lines with equidistant profile increment
- equidistant trace increment
- equidistant time increment
- same number of points per trace
- same number of traces per 2D-line



If these preconditions are satisfied you may easily construct a 3D-file without a spatial interpolation:

1. enter the module **3D-datainterpretation**

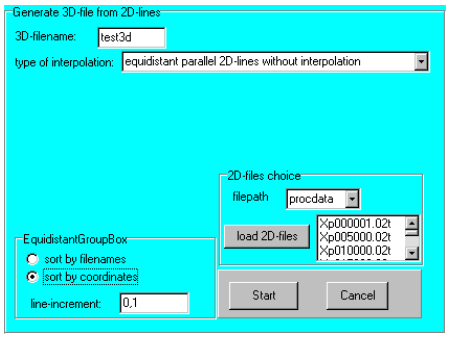
2. activate the option **file/Generate 3D-file from 2D-files**

3. choose the following options within the **Generate 3D-file from 2D-lines menu**:

<u>3D-filename:</u> enter any name for the 3D-datafile

<u>type of interpolation:</u> equidistant parallel 2D-lines without interpolation

EquidistantGroupBox:
choose either <u>sort by filenames</u> or <u>sort by coordinates</u> (see item 4)
<u>line-increment:</u> enter the increment between the different 2D-lines



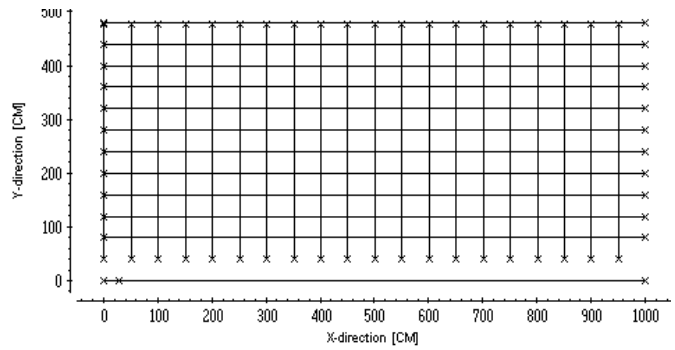
4. choose the wanted **filepath** and activate the option **load 2D-files** in order to choose the wanted 2D-files from the openfile dialog (multiple choice using the shift or str-key). The sorting of the 2D-files depends on the chosen option within the EquidistantGroupBox. With <u>sort by filenames</u> activated all chosen original datafiles are sorted with ascending filename order. To be considered: problems may occur if the files have names like file1, file2,..., file10, file11. In this case the choosen files are resorted in thefollowing manner: file1, file10, file11, file12, ... ,file2, ... which leads to a wrong sorting within the resulting 3D-file. With <u>sort by coordinates</u> activated all chosen original datafiles are sorted with ascending profileconstant coordinates. In this case the profileconstant coordinates must have been defined first within the fileheader.

5. Activating the option **start** starts the generation of the 3D-datafile. The 3D-file is generated without any interpolation. With ProfileDirection set to X and ProfileConstant set to Y the number of points in x-direction is equal the number of traces per 2D-file, the number of points in y-direction is equal the number of 2D-files and the number of points in z-(time-)direction is equal the number of points per trace. The file will be stored under the path rohdata under the current project directory. After having created the file the 3D-data are automatically loaded into the RAM (see also chap. 0.9.3). The 3D-datafile can be processed within the 2D-dataanalysis (see chap. 0.9.2).

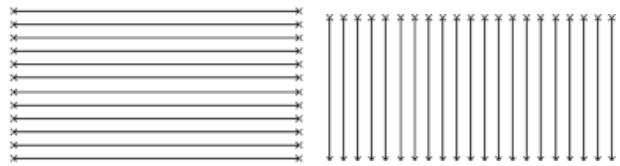
I.2 Generating a 3D-file with interpolation (done within the 3D-datainterpretation)

A 3D-datafile may also be generated from REFLEXW formatted 2D-lines. The 2D-lines may be raw data (then the processing is done for the 3D-datafile) or already processed data. There are no general rules whether the processing shall be done for the 3D-datafile or for the individual 2D-lines. If only few 2D-lines are present it might be better to do the processing for the 2D-lines.
REFLEXW allows to construct a 3D-datafile either from equidistant parallel or crossing 2D-lines (chap. 0.9.1.2.1) or from 2D-lines freely orientated within one acquisition plane (chap. 0.9.1.2.1) both using a weighted interpolation. In any case the coordinates (start- and endcoordinate in profiledirection and profileconstant coordinate) must have been defined within the file- or traceheader(s) of each 2D-line.

I.2.1 Generating a 3D-file from parallel or crossing 2D-lines



If the original data are not parallel equidistant lines of constant lengths but they have for example different lenghts, different start coordinates or crossing lines you may use the interpolation routines within REFLEXW for generating a new 3D-datafile. You may also use this interpolation for parallel equidistant lines (see also chap. 0.9.1.1.2) if an interpolation is wanted (e.g. if only few 2D-lines exist).
To be considered: The necessary processing (see chap. 0.9.2.) should always be done onto the original 2D-datafiles. Therefore the 3D-datafile should be generated based on the completely processed 2D-datafiles.

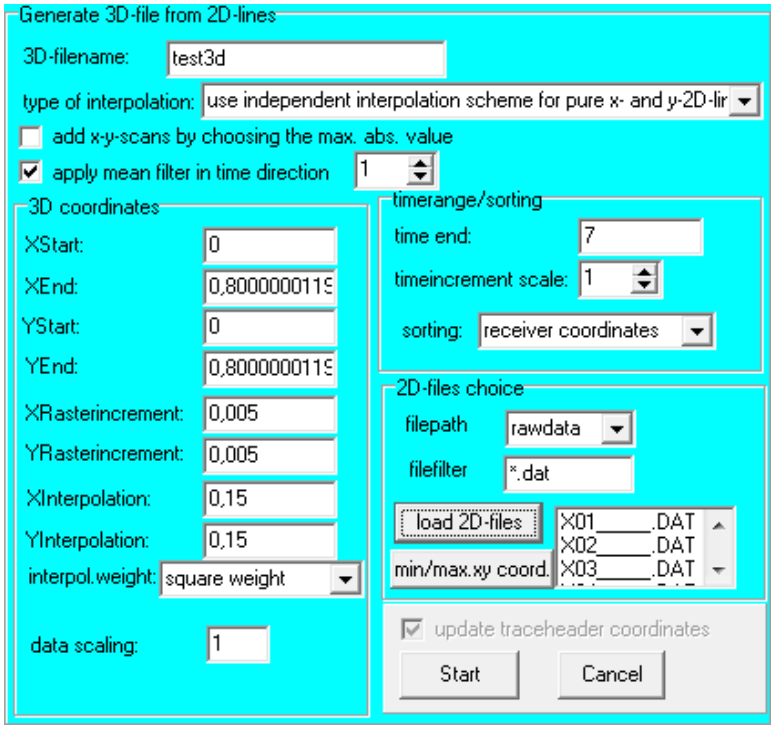


generation flow:

1. enter the module **3D-datainterpretation**

2. activate the option **file/Generate 3D-file from 2D-files**

3. choose the following options within the **Generate 3D-file from 2D-lines menu**:



3D-filename: enter any name for the 3D-datafile

type of interpolation: use independent interpolation scheme for pure x- and y-2D-lines

3D coordinates group box :
XStart, XEnd, YStart and YEnd: specify the range coordinates within the dataacquisition plane for the computation of the 3D-data cube.
XRasterincrement and YRasterincrement: specify the grid interval of the two coordinate axes spanning the plane in the given distance dimension. A useful value for both XRasterincrement and YRasterincrement is the traceincrement used for the individual 2D-profiles.
XInterpolation and YInterpolation: define the interpolation area (a rectangle) in the given distance dimension. To guarantee a complete filing of the 3D-data cube the interpolation range in x- and y-direction has to comply with the greatest occuring distance between two data points in the correspoinding direction whereby a too large range leads to an averaging.
interpol.weight: allows to specify the type of the interpolation weight.

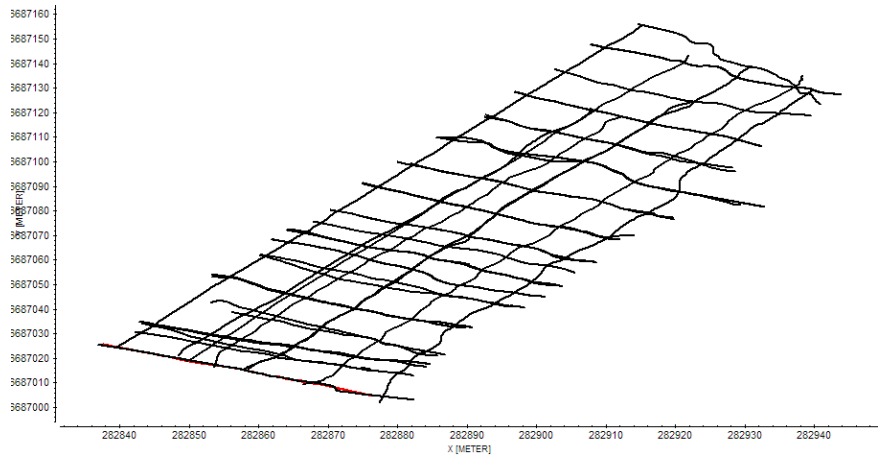
timerange/sorting group box :
time end: specifies the timerange for the 3D-data. The start time is always 0.
sorting: determines the sorting of the profiles entering the computation of the time slices. Four different sortings are possible: fileheader coordinates or receiver coordinates, midpoint coordinates and CMP coordinates (defined within the individual traceheaders).

4. choose the wanted **filepath** and activate the option **load 2D-files** in order to choose the wanted 2D-files from the openfile dialog (multiple choice using the shift or str-key).

5. Activating the option **start** starts the generation of the 3D-datafile. The number of datapoints depends on the entered range of the 3D-cube and the raster increments. To ensure, that the resulting 3D-file does not exceed the max. size of 2048^3 points, the parameters XRasterincrement and YRasterincrement can be enlarged and/or the volume of the data to be considered can be reduced. The file will be stored under the path rohdata under the current project directory. After having created the file the 3D-data are automatically loaded into the RAM (see also chap. 0.9.3). The 3D-datafile can be processed within the 2D-dataanalysis (see chap. 0.9.2).

I.2.2 Generating a 3D-file for freely distributed 2D-lines

If the original data are freely distributed within the acquisition plane you must use the interpolation routines within REFLEXW for generating a new 3D-datafile. To be considered: The necessary processing (see chap. 0.9.2.) should always be done onto the original 2D-datafiles. Therefore the 3D-datafile should be generated based on the completely processed 2D-datafiles.

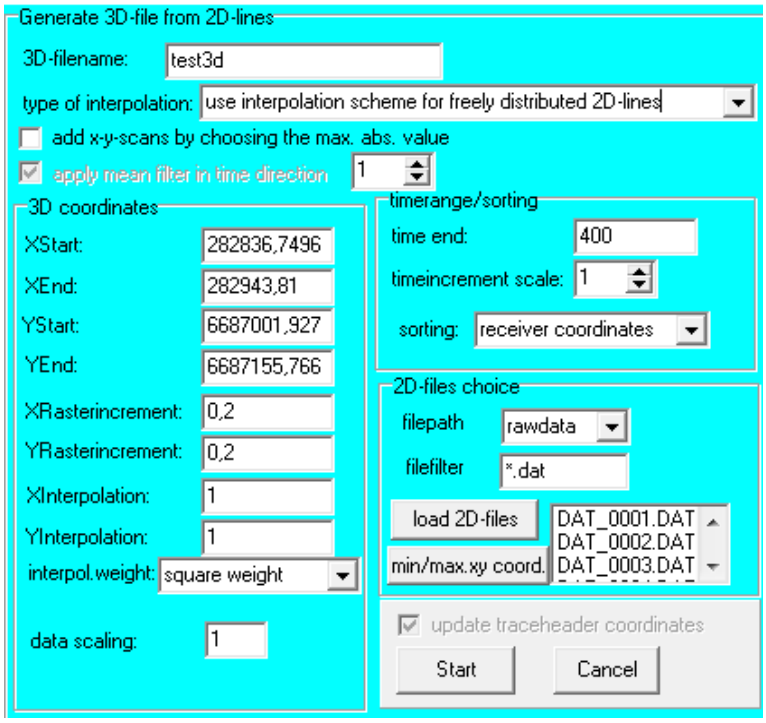


generation flow:

1. enter the module **3D-datainterpretation**

2. activate the option **file/Generate 3D-file from 2D-files**

3. choose the following options within the **Generate 3D-file from 2D-lines menu**:

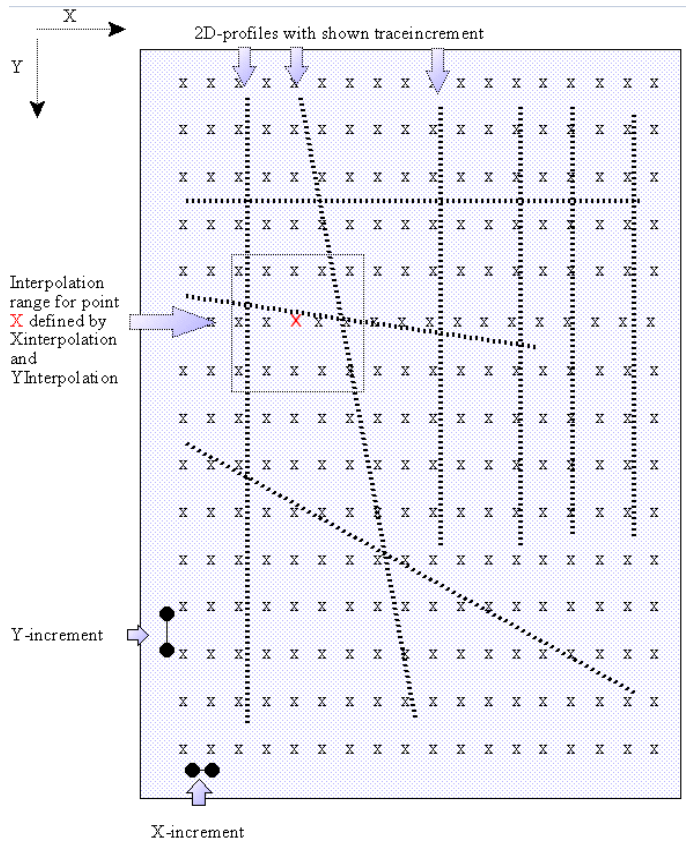


<u>3D-filename:</u> enter any name for the 3D-datafile

<u>type of interpolation:</u> use interpolation scheme for freely distributed 2D-lines

3D coordinates group box :
<u>XStart, XEnd, YStart and YEnd:</u> specify the range coordinates within the dataacquisition plane for the computation of the 3D-data cube.
<u>XRasterincrement and YRasterincrement:</u> specify the grid interval of the two coordinate axes spanning the plane in the given distance dimension. A useful value for both XRasterincrement and YRasterincrement is the traceincrement used for the individual 2D-profiles.
<u>XInterpolation and YInterpolation:</u> define the interpolation area (a rectangle) in the given distance dimension. To guarantee a complete filing of the 3D-data cube the interpolation range in x- and y-direction has to comply with the greatest occuring distance between two data points in the correspoinding direction whereby a too large range leads to an averaging.

interpol.weight: allows to specify the type of the interpolation weight.



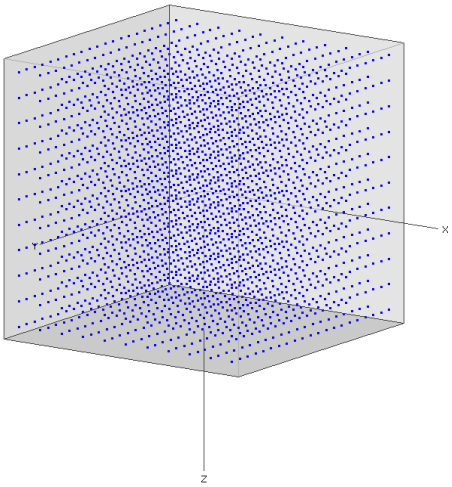
timerange/sorting group box :
time end: specifies the timerange for the 3D-data cube. The time always starts at 0.
sorting: determines the sorting of the profiles entering the computation of the time slices. Four different sortings are possible: fileheader coordinates or receiver coordinates, midpoint coordinates and CMP coordinates (defined within the individual traceheaders).

4. choose the wanted **filepath** and activate the option **load 2D-files** in order to choose the wanted 2D-files from the openfile dialog (multiple choice using the shift or str-key).

5. Activating the option **start** starts the generation of the 3D-datafile. The number of datapoints depends on the entered range of the 3D-cube and the raster increments. To ensure, that the resulting 3D-file does not exceed the max. size of 2048^3 points, the parameters XRasterincrement and YRasterincrement can be enlarged and/or the volume of the data to be considered can be reduced. The file will be stored under the path rohdata under the current project directory. After having created the file the 3D-data are automatically loaded into the RAM (see also chap. 0.9.3). The 3D-datafile can be processed within the 2D-dataanalysis (see chap. 0.9.2).

I.3 resulting REFLEXW 3D-datafile

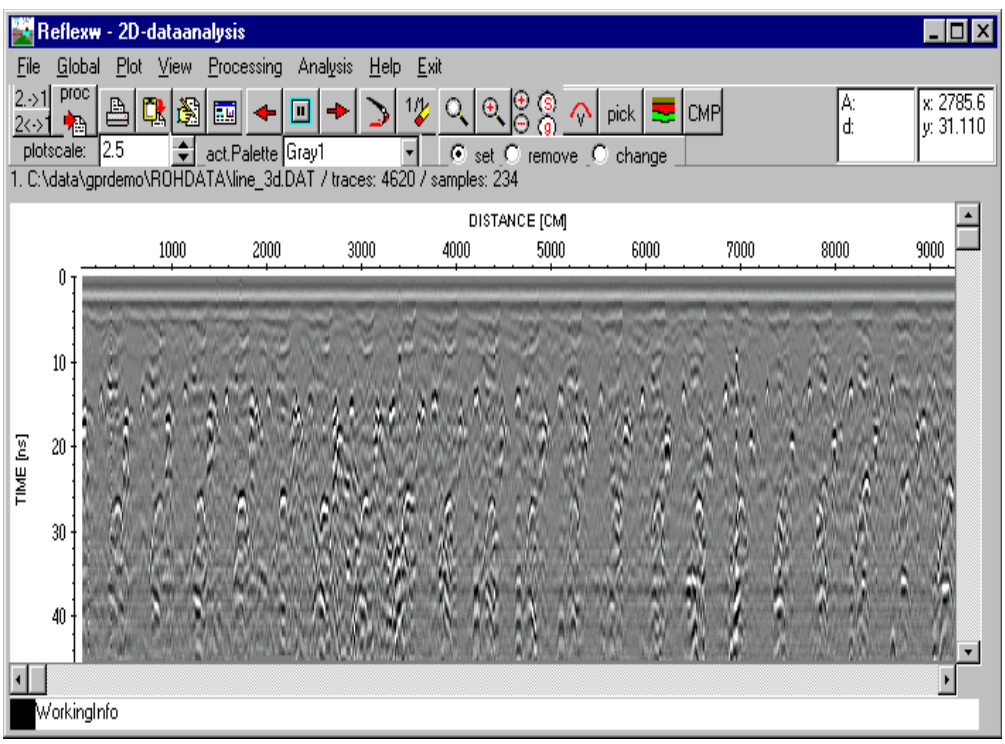
The resulting 3D-file is a new file with equidistant rasterincrements in x, y or z (time) direction. The 3 rasterincrements may differ. The max. number of points in one direction is 2048, the max. size is 2048*2048*2048 points.



The resulting 3D-file has the same REFLEXW format like a 2D-datafile and may be processed within the 2D-dataanalysis module (chap. II) whereby the interpretation must be done within the 3D-datainterpretation (chap. III).

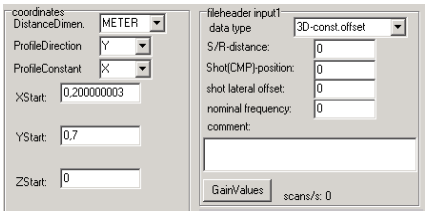
The different 2D-lines are stored sequentially. The distance axis within the 2D-dataanalysis represents the distance sum over all 2D-lines. Because of the normally huge number of traces and the chosen plotmode (Pointmode, XYScaledPlot) the screen display resolution may be too small to plot the data correctly (XScale too small). In this case choose the Zoom-option in order to only display a small part of the data in x-direction.

To be considered: If only few 2D-lines have been acquired with a large number of traces the resulting 3D-datafile may have many points in one direction and very few in the other. In this case it might be better to use the interpolation method for generating a 3D-datafile from REFLEXW formatted 2D-lines (see chap. I.2.1) especially if you want to display timeslices. Although it is clear that the resolution will not be enhanced the timeslices may appear more reasonable by the averaging of the interpolation.

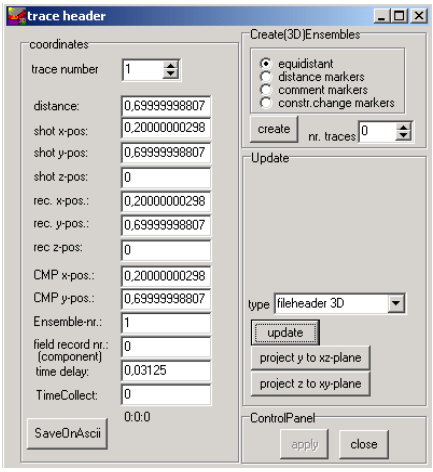


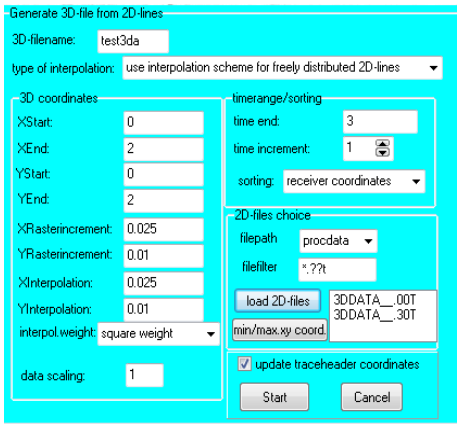
I.4 combine different 3D-datafiles

The option generate 3D-file from 2D-lines as described in chap. 0.9.1.2.2 can also be used in order to combine different 3D-datafiles into one 3D-datafile. It is recommended that all 3D-datafiles have the same trace- and lineincrements but in principle they can also differ. The calculation must be based on the traceheader xy-receiver coordinates. Therefore the following processing flow must be done:



1. Load the first 3D-file within the 2D-dataanalysis and enter the edit **fileheader** menu and define the correct start x and y-coordinate if not already done. Set the data type to **3D const. offset** and click on save.
2. Click on show traceheader and update the traceheader coordinates for using the update option **fileheader-3D** within the trace header menu.
3. Do step 1 and 2 for all wanted 3D-files.
4. Enter the **3D-datainterpretation** module and choose the option **generate 3D-file from 2D-lines** and activate the interpolation type use <u>interpolation scheme for freely distributed 2D-lines</u>. Enter the overall xy-range and the <u>x- and y-raster increments</u>. Useful values for the x- and y-increments are the traceincrement (corresponds to x-increment for profiledirection X and y-increment for profiledirection Y) and the lineincrement (corresponds to x-increment for profileconstant X and y-increment for profileconstant Y) of the original 3D-datafiles. If all 3D-files have the same increments the <u>Xinterpolation and Yinterpolation</u> can be set to the same value of the rasterincrements. In this case no interpolation will be done. Enter the <u>time end</u> and set <u>sorting</u> to <u>receiver coordinates</u>. Choose the wanted 3D-files using the option load 2D-files and enter a 3D-filename and click on start. The resulting 3D-file contains all informations of the chosen 3D-files within the given overall xy-range.





II. processing a 3D-data file (done within the 2D-dataanalysis)

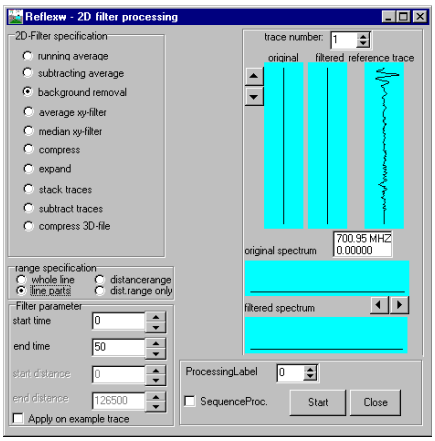
A **3D-data file** is a single REFLEX formatted file which consists of several equidistant 2D-cuts sequentially stored. All traces belonging to one 2D-cut have the same ensemble-number which is stored within the REFLEXW traceheader. The direction (x or y) within the fileheader determines the direction of the 2D-cuts.
A 3D-data file may be processed like any 2D-file (see for example filtering guide) but there are some peculiarities to be considered for:

1. If the 3D-datafile is generated by an interpolation (chap. I.2) the complete processing should be always applied onto the original 2D-datafiles.

2. If the data contain hyperbola from small scale objects or from pipes a migration is necessary in addition if timeslices are used for the interpretation (see also chap. III).

3. The processing step static correction is very important because the same time baseline must be used for all 2D-cuts. Otherwise the timeslices are not correct.

4. multichannel filters like background removal or fk-filter:
 the option **line parts** should be activated. In this case the distance range for applying the filter is automatically determined for line parts (individual 2D-cuts) separated by each other by a new ensemble number.



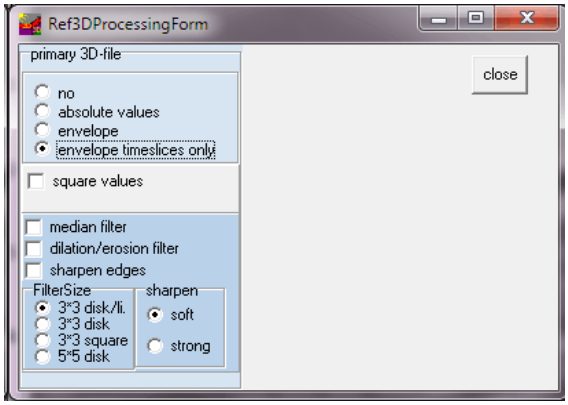
III. interpretation of a 3D-data file (done within the 3D-datainterpretation)

The module 3D data-interpretation allows the interpretation of 3-dimensional data by displaying x-, y- or z-slices or the full 3D-data volume.
The data are completely loaded into the RAM of the computer whereby a fast visualization of the data is possible. The max. number of points in each direction (x-cuts, y-cuts and z-(time)cuts) is 2048.Three different display options are available (option windows, option scroll and option 3D-cube - see below).

III.1 load a 3D-datafile

1. enter the **3D-datainterpretation**

2. load the 3D-datafile using the option **File/Open 3D-file**



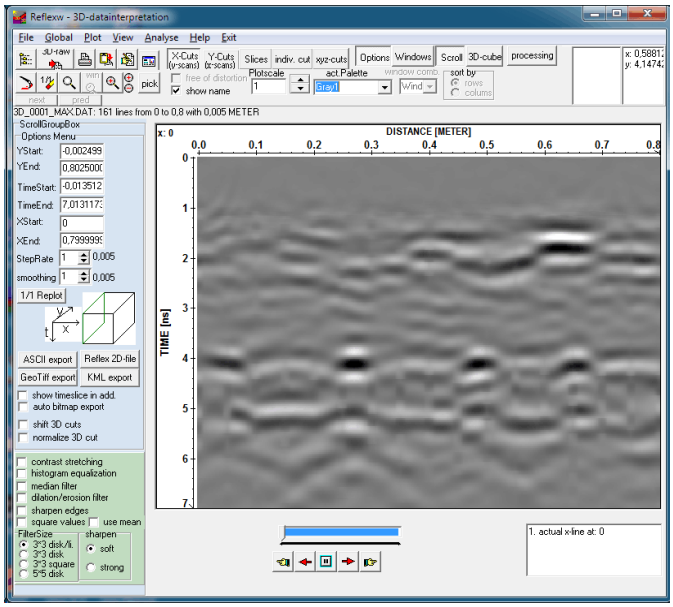
3. After having chosen the wanted 3D-file the Ref3DProcessingFom menu opens which allows you to define the internal processing of the 3D-file. Use **envelope timeslices only** if you want to display both timeslices and "normal" x-, y-cuts.

4. activate the option **close** and the chosen 3D-file is loaded into the RAM.

5. The internal processing may be changed at a later stage using the option **processing**.

III.2 display a 3D-datafile using the scroll option

1. after having loaded a 3D-datafile activate the option **scroll**



2. Activating one of the three different **cuts** (X-Cuts, Y-Cuts or Slices) allows to scroll through the 3D-datacube into the given direction using the scroll bar or the arrows. The option xyz-cuts allow the simultaneous display of the 3 cuts (see chap. III.2.1)

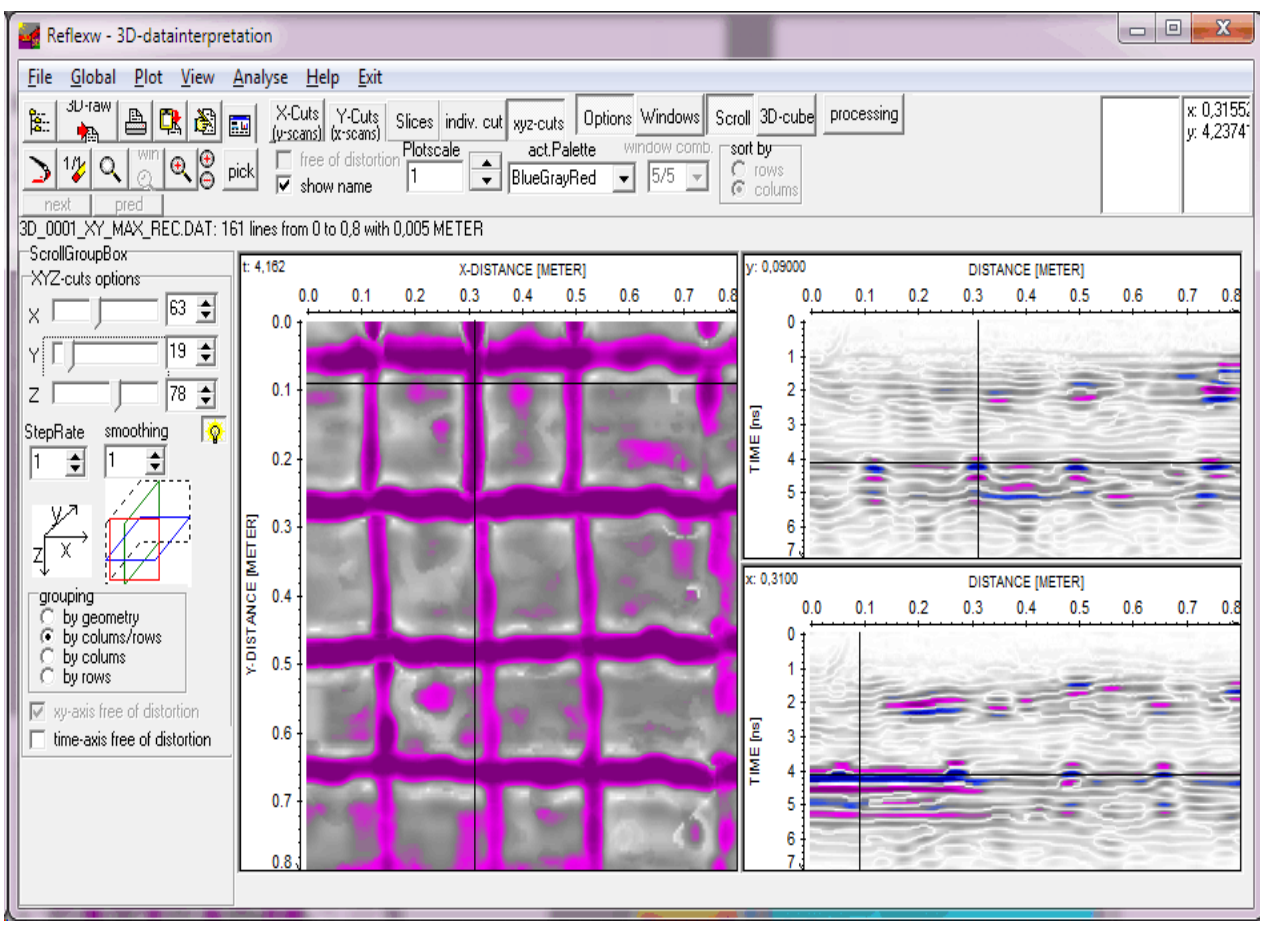
3. The coordinate parameters within the Options Menu are automatically set. The option StepRate allows you to change step rate for scrolling. Every step range 2D-cut will be plotted when scrolling. The option smoothing allows to enter a value for smoothing the data in the scroll direction. A value of 1 means no smoothing. A value of 2 means that 2D-cuts are summed up and the mean values are calculated. The smoothing parameter is independent from the StepRate parameter.

4. There are some other optional options for direct filtering and output.

III.2.1 xyz-cuts option

1. The option **xyz-cuts** allows different simultaneous display possibilities of the 3 cuts. The actual positions of the other cuts are indicated by a large cross within each cut.
A fast interactive change of the cuts is done by several mouse actions:
- the mouse wheel can be used in order to go through any of the cuts
- pressing the left mouse button allows to control the other cuts within any cut.

2. The **grouping** box allows the following display types:
- **by geometry** (see picture below). The z-cut (slice) is displayed on the top/left surrounded by the x- and y-cut using a free of distortion scale and using a time axis scale which automatically takes into account the velocity entered for the depth axis within the plotoptions menu or within the xyz-cut option panel.
- **by colums/rows** (see picture above). The xy-cuts are displayed right to the z-cut (slice). The time axis scale of the xy-cuts may be adjusted to the xy-scale activating the option **time axis free of distortion**
- **by colums** (see picture below): all three cuts will be displayed within one row with the z-cut (slice) in the middle
- **by rows** (see picture below): all three cuts will be displayed within one column with the z-cut (slice) in the middle
Activating one of the three different **cuts** (X-Cuts, Y-Cuts or Slices) allows to scroll through the 3D-datacube into the given direction using the scroll bar or the arrows.



III.3 display a 3D-datafile using the windows option

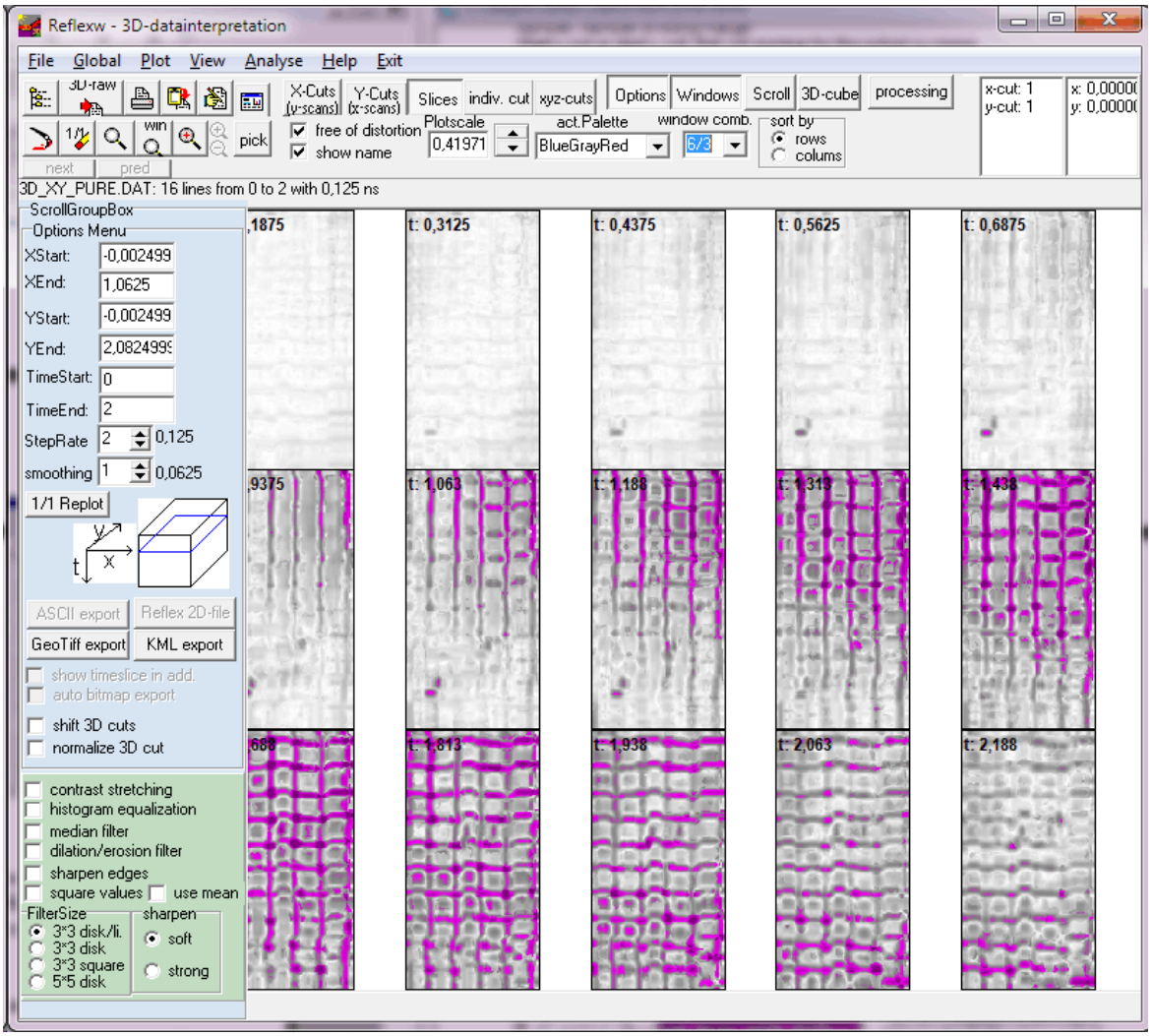
1. after having loaded a 3D-datafile activate the option **windows**

2. Activating one of the three different **cuts** (X-Cuts, Y-Cuts or Slices) allows to display several 2D-cuts of the 3D-cube, placed in freely choosable manner within the working window.

3. The **coordinate** parameters within the Options Menu are automatically set. The max. number of cuts to be displayed simultaneously is 25. The program automatically calculates the StepRate for the given cut range (in this example TimeStart and TimeEnd) and calculates the increment (this example 0.125 ns). You may manually change these parameters.

4. The option **window comb.** allows to choose the combination of the windows to be subdivided in horizontal and vertical direction. the possible combinations are automatically predefined. If you have 24 different cuts to be displayed you may choose the combination 8/3 - this means the screen is subdivided into 8 horizontal and 3 vertical cuts.

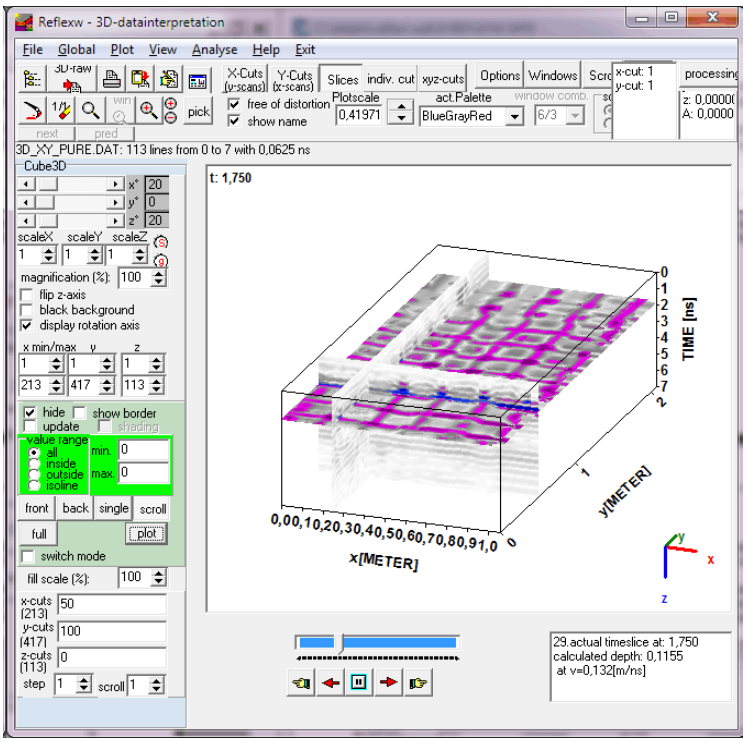
5. The option **Options** can be deactivated. In this case the OptionsMenu disappears and the full screen is visible.



III.4 display a 3D-datafile using the 3D-cube option

1. after having loaded a 3D-datafile activate the option **3D-cube**

2. The 3D-cube will be displayed together with the Cube3DOptions menu.



3. The **size** of the 3D-cube is determined from the number of the points into the different directions x, y and z(time). The point numbers are displayed within the options min/max for x, y and z. Here you also may restrict the range. The axis scales of the 3D-cube are based on these values and do not correspond to the real coordinates. This may significantly differ for example if the 3D-datafile has been created without interpolation (traceincrement and lineincrement differ significantly). It is possible to change the axis scales using the options **ScaleX**, **ScaleY** and **ScaleZ**.

4. You have the possibility to look at the cube from different angles, e.g. from the front side, the back side or from the side. The angles can be changed manually within the options **x°**, **y°** and **z°** or using the mouse with pressed left mouse button within the 3D-cube display.

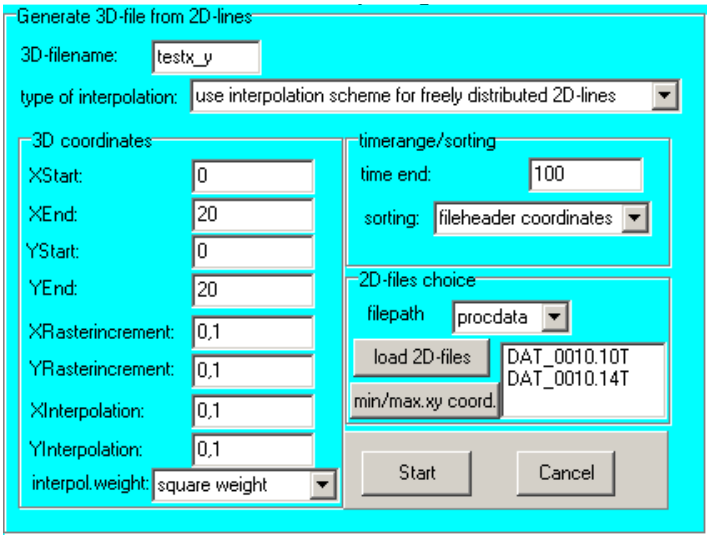
5. You have different display possibilities. You may select if only the front or back planes of the data cube are displayed (options **front** and **back**) or the full 3D-data volume (option **full**). In addition you only may select single cuts (option **single**) and scroll (option **scroll**) through the cube in one distinct direction.

IV. 3D-view of single 2D-lines with arbitrary geometry

In many cases only few 2D-lines with different geometry (parallel or crossing or any other angle) have been acquired which you also want to display within a 3D-cube. The following chapter describes how to manage such a 3D-view of single 2D-lines with arbitrary geometry. Precondtion is that the geometries of the 2D-lines have been specified either within the fileheaders or within the individual traceheaders.

1. enter the module **3D-datainterpretation**

2. activate the option **file/Generate 3D-file from 2D-files**



3. choose the following options within the **Generate 3D-file from 2D-lines menu**:

<u>3D-filename:</u> enter any name for the 3D-datafile

<u>type of interpolation:</u> use interpolation scheme for freely distributed 2D-lines

3D coordinates group box :
<u>XStart, XEnd, YStart and YEnd:</u> specify the range coordinates within the dataacquisition plane for the computation of the 3D-data cube.
<u>XRasterincrement and YRasterincrement:</u> specify the grid interval of the two coordinate axes spanning the plane in the given distance dimension. A useful value for both XRasterincrement and YRasterincrement is the traceincrement used for the individual 2D-profiles. The rasterincrements should not be smaller than the increments within the original 2D-lines.
<u>XInterpolation and YInterpolation:</u> enter the same values as for Xrasterincrement and Yrasterincrement in order to avoid any interpolation.
<u>interpol.weight:</u> allows to specify the type of the interpolation weight. It has no meaning if the interpolation values match the rasterincrements.

timerange/sorting group box :
<u>time end:</u> specifies the timerange for the 3D-data cube. The time always starts at 0.
<u>sorting:</u> determines the sorting of the profiles entering the computation of the time slices. Four different sortings are possible: fileheader coordinates or receiver coordinates, midpoint coordinates and CMP coordinates (defined within the individual traceheaders).

4. choose the wanted **filepath** and activate the option **load 2D-files** in order to choose the wanted 2D-files from the openfile dialog (multiple choice using the shift or str-key).

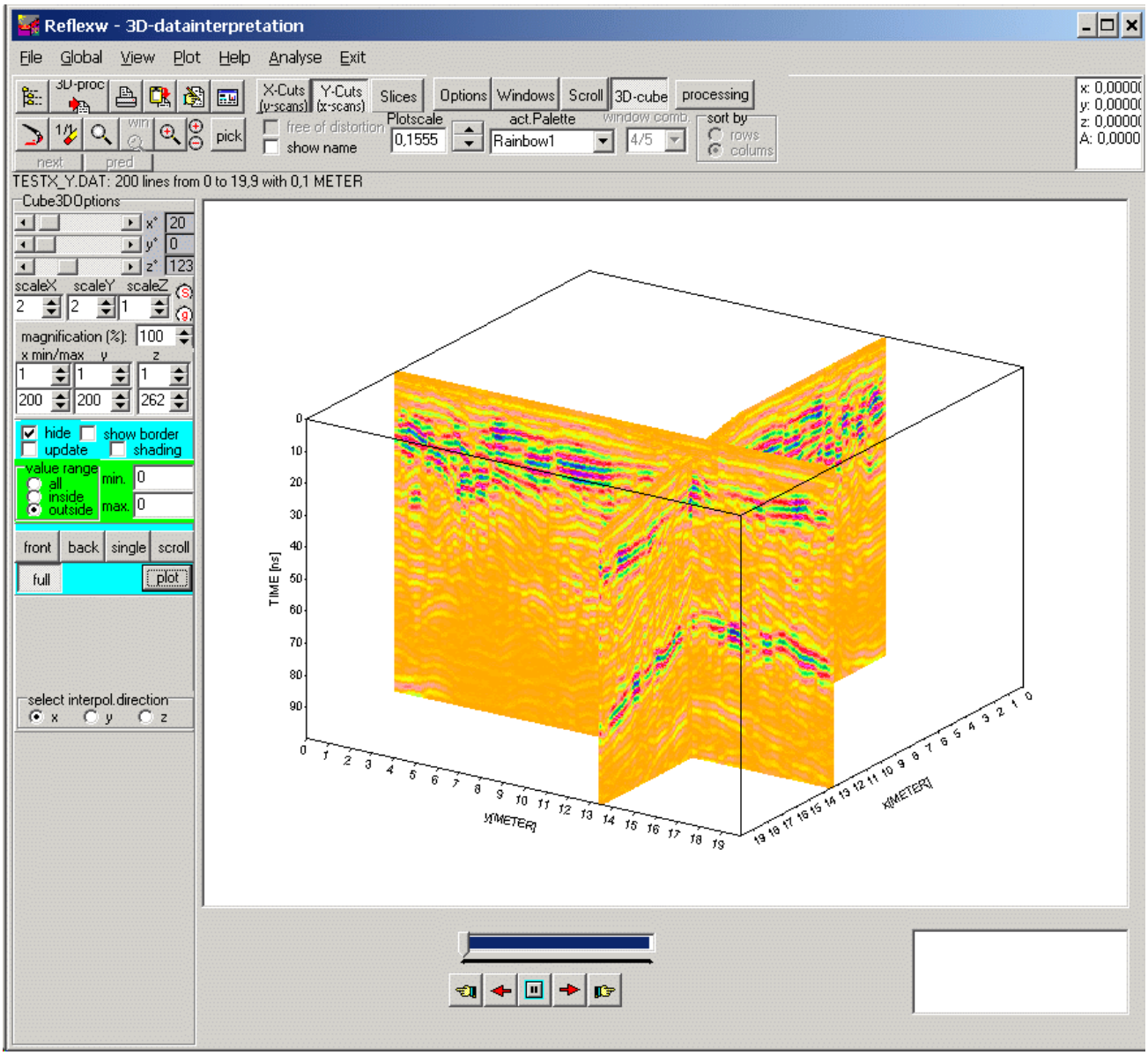
5. Activating the option **start** starts the generation of the 3D-datafile. The number of datapoints depends on the entered range of the 3D-cube and the raster increments. To ensure, that the resulting 3D-file does not exceed the max. size of 2048^3 points, the parameters XRasterincrement and YRasterincrement can be enlarged and/or the volume of the data to be considered can be reduced. The file will be stored

under the path rohdata under the current project directory. After having created the file the 3D-data are automatically loaded into the RAM. The resulting 3D-file contains 0 amplitude values at all positions where no original data are present.

6. Activate the option **3D-cube.** The other 2 display modes (scroll and windows) may not be very useful because of the 0 values at the non originally covered positions. Use any of the available scaling and rotating options in order to get the best 3D-view.

7. Activate the option **outside** within the Cube3DOptions box and enter the **value range** 0 for **min.** and 0 for **max**. This ensures that all 0 values will not be taken into account when plotting the 3D-data.

8. Activate the option **full** and plot the data by pressing the option **plot**.



9. If any other combination of the original 2D-lines is wanted a new 3D-file must be generated (items 3-8).