

Main news of the REFLEXW version 10.0-10.5 from 01.04.2022- 05.11.2024

update history ver. 10

ver 10.5 (26.09.2024)

- import format Proceq modified for the system GP8100
- new option signal correction within the FD-modelling
- new option median for smoothing the trace header coordinates
- IDS OGPR ver 2 import, e.g. 32 bit data
- new option Scaling within the 3Dprocessing form
- new option use newer checks for the import of IDS-data
- new option correct z-values within the processing option correct picked phase
- new export option ImpulseRadar
- new options for the background bitmap within the show line position menu

ver 10.4 (01.01.2024)

- import format ImpulseRadar - new option use reference line
- new option original trace numbers for updating the traceheader coordinates
- import of IDS OGPR data

ver 10.3 (01.09.2023)

- import format ImpulseRadar - the tsp file is now supported
- import of ASCII-Proceq-PD80 data
- smooth xyz-coordinates during the import
- new ASCII-format for the Coorect 3Dtopography processing option
- now the depths are exported for the picks for different ASCII formats

0. General

A warning message appears if the project directory has been chosen under the path C:\PROGRAM FILES (X86)

The program stops with a warning message if the subdirectories under the project directory do not exist.

64 bit version:

A full 64 bit version is now available. For this version the max. number of datapoints within the 3D-datainterpretation has been drastically increased to 8192 in all directions.

I. 2D-dataanalysis

global settings:

new option **NMEA String:** with \$G*GGA the standard NMEA string like GNGGA will be analysed. With \$GNLLQ activated a special GNLLQ string will be analysed which normally contains Gauss Krueger coordinates.

New option **White background for free datarange:** if activated the background color given within the plotoptions is used for printing or bitmap export for a free area range. A free area range might be present if the manual scaling option is used. If deactivated the 0 amplitude value color is used - included 06.12.2022.

New option **Add. Filename for comment.fil:** if activated the filename comment.fil for the comment markers will be replaced by the actual profile filename (without extension) plus _comment.fil, e.g. file0001_comment.fil. Thereby each profile file will receive an own comment marker file - included 14.02.2023.

general settings:

New speed button **jpg** - copy image to file (jpg or other formats)

New dataview split option **man.** if more than 2 files have been loaded:



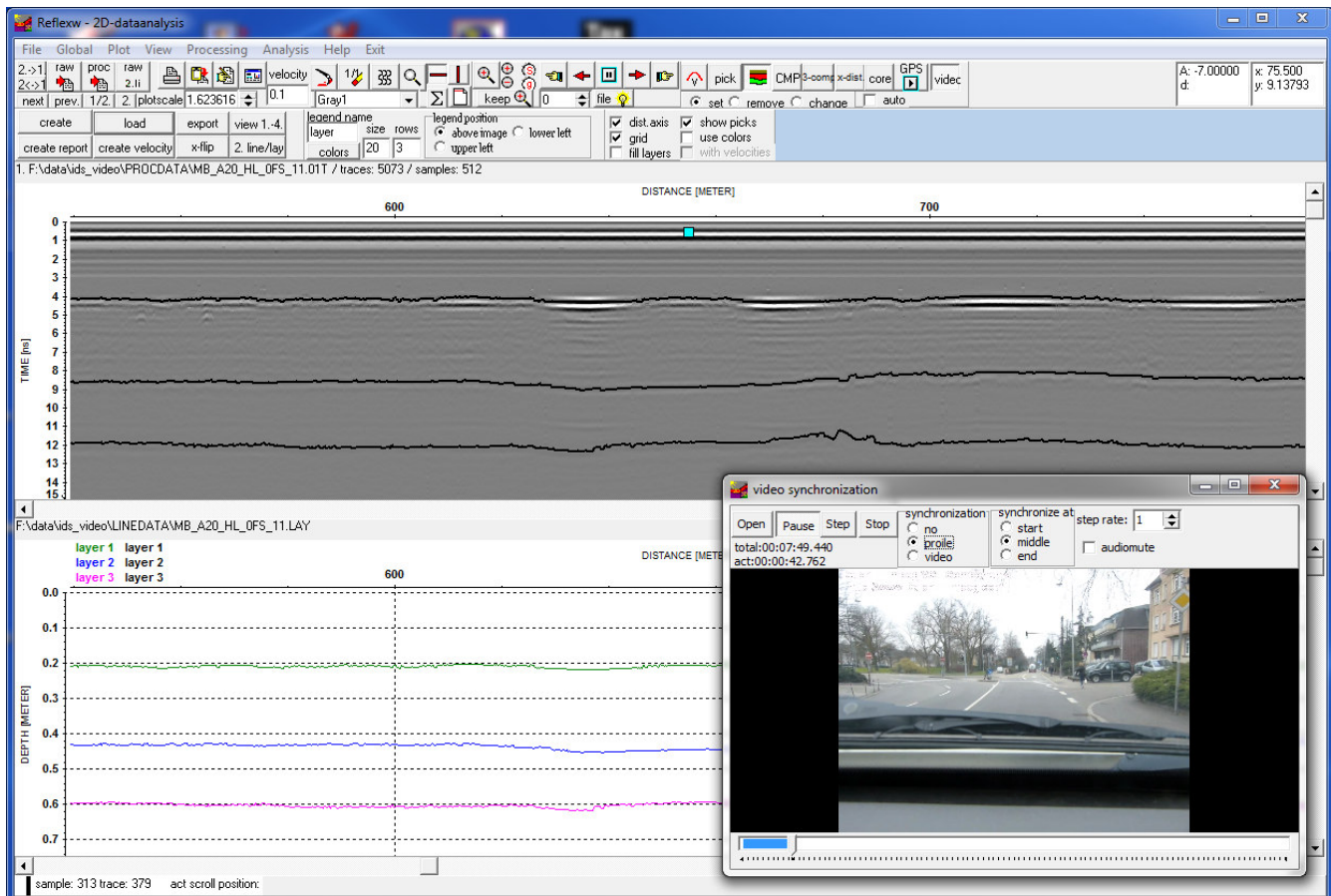
It is possible to manually change the display order. Click on one item (1..4) within the CheckListBox and use the mouse with pressed mouse button in order to exchange two items (this item with any other one). The option ver., hor. and split define the type of display splitting.

plot options:

new option **only right axis** - if the option is activated, in case of of a distance/depth section (e.g. after a time depth conversion) the elevation axis is drawn on the right side only.

Included 04.08.2023

New option **video** - the option allows to synchronize the data with a video. Precondition is a txt file file The option allows to control the display of the current profile by a video and vice versa.



Precondition is a txt file file of the following format:

Each line contains

- the video time in hour:minute:second
- a Scan_ID identical to the tracenummer which will not be interpreted
- a Swatz_ID which will not be interpreted
- the distance along the profile

Example in which the gpr profile starts at the video time 10 sec:

```
00:00:1.000 0 1 0.00
00:00:2.000 0 1 0.00
00:00:3.000 0 1 0.00
00:00:4.000 0 1 0.00
00:00:5.000 0 1 0.00
00:00:6.000 0 1 0.00
00:00:7.000 0 1 0.00
00:00:8.000 0 1 0.00
00:00:9.000 0 1 0.00
00:00:10.000 0 1 0.00
00:00:11.000 100 1 5.00
00:00:12.000 200 1 10.00
00:00:13.000 300 1 15.00
00:00:14.000 400 1 20.00
00:00:15.000 500 1 25.00
00:00:16.000 600 1 30.00
00:00:17.000 700 1 35.00
```

The option opens a new panel where you can enter the necessary parameters for the synchronization.

Open allows to open a video file, e.g. a mp4 file. The video synchronization text file with the same filename but with the extension txt must exist. Otherwise an error message appears.

The synchronization panel allows to synchronize the gpr profile with the video (profile activated) or vice versa (video activated).

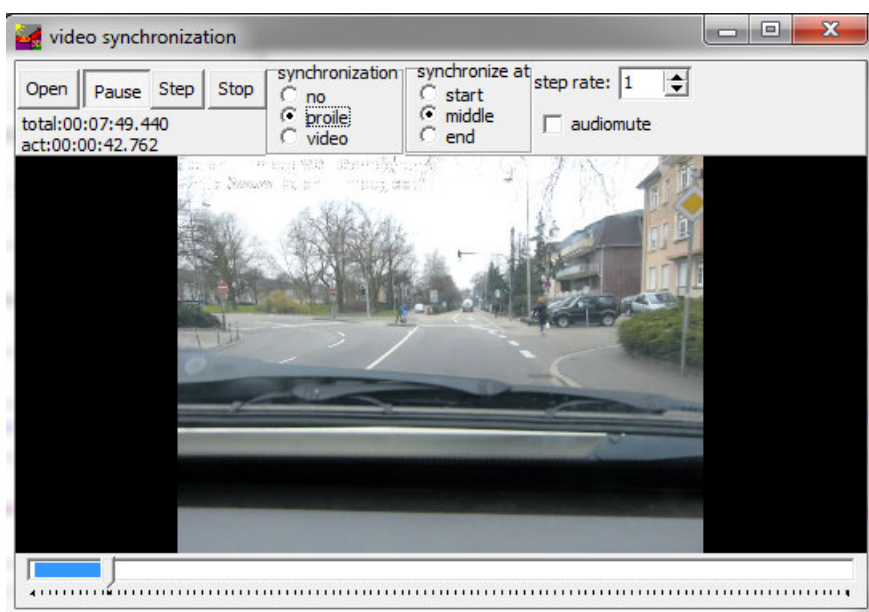
The synchronize at panel allows to specify the location of the actual video within the gpr profile (start, middle or end).

The step rate allows to set a rate for the synchronization.

Activate the option audiomute in order to mute the audio.

The option Pause pauses the video and the synchronization. Step allows to step one video screen forward. Stop stops the video and the synchronization.

The trackbar at the bottom allows to switch to any part of the video.



1. Data Import:

The menu will be opened using the property ShowModal. This prevents that other menus might be opened until the menu will be closed.

new datatype **single shot/borehole xyz**

filename specification **original name**: new option **reverse dot search**. If activated the dots which are normally used for the determination of a file extension will be searched from the end of the filename instead from the beginning. This might be useful if a date separated by dots is used for the original filename. The dots within the original name will be automatically replaced by an underline character.

Example:

original filename 29.11.2022 144323_001_A01.iprb

With deactivated option the Reflexw filename will be: 29_____.dat

With activated option the Reflexw filename will be: 29_11_2022 144323_001_A01.dat

- included 14.12.2022, modified 01.07.2023.

Mala: new marker file format MRKJ is supported.

Proceq SEGY new option Proceq format (modified 29.03.2024, ver 10.5)

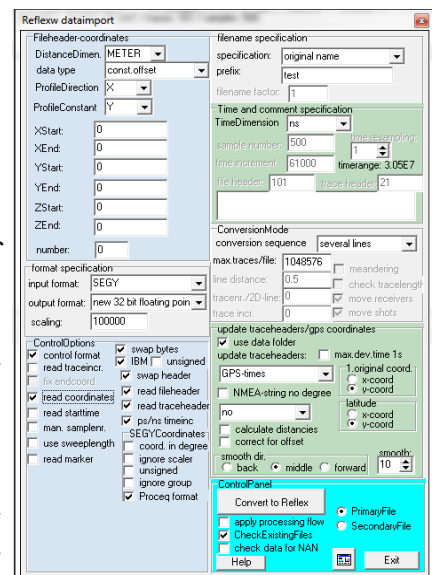
With the option Proceq format the SEGY-formatted data are assumed coming from a Proceq GPR system. The timedimension will be automatically set to ns and the option ps/ns timeinc will be activated. The SEGY-data exported from the Proceq system show small original data values and therefore a quite large scaling factor (e.g. 10000) is recommended.

Two additional csv files may be present which will be interpreted.

The first one contains some metadata which will be partly interpreted if either the option read traceincr. or read coordinates is activated. Dependent on the type of acquisition (line scan or area scan, single frequency or dual frequency) one csv file is present for each segy-file or only one csv file is present for the whole block of scans of one area.

In addition the dual frequency antenna produces two segy-files (_LF and _HF) but only one csv-file.

The GP8100 is a 6 channel system which filenames differ in such a way that the channel is included by e.g. _1A(first channel of first scan) or _11F (last channel of 11. scan). This system also allows to acquire line and area scans.



Example line scan:

Linescan Feb 2021-007_20210727_175020_HF.sgy ->

Linescan Feb 2021-007_20210727_175020.csv

Linescan Feb 2021-007_20210727_175020_LF.sgy ->

Linescan Feb 2021-007_20210727_175020.csv

Example area scan:

Areascan002_L001_20210726_135121_HF.sgy->

Areascan002_20210726_135121.csv

Areascan002_L001_20210726_135121_LF.sgy->

Areascan002_20210726_135121.csv

Areascan002_L002_20210726_135121_HF.sgy->
Areascan002_20210726_135121.csv
Areascan002_L002_20210726_135121_LF.sgy->
Areascan002_20210726_135121.csv
.....

Example area scan GP8100:

Areascan002_L001_1A_20210726_135121_HF.sgy->
Areascan002_L002_1B_20210726_135121_HF.sgy->
....
Areascan002_L006_1F_20210726_135121_HF.sgy->
Areascan002_L007_2A_20210726_135121_HF.sgy->
.....

From the filename (if the labeling L001... exists) the program automatically determines whether a linescan or an area scan is present.

Accordingly the program automatically determines whether the data stem from the 6 channel GP8100 system.

With the import option **read traceincr.** activated only the traceincrement will be read from the csv file. The following parameters are read from the csv file if available:

Repetition Rate [scan/cm] -> traceincrement
Antenna Spacing [cm] -> S/R distance

With the option **read coordinates** activated the start and end coordinates of the profile as well as the scan length are read from the csv file. This holds true both for a line scan and an area scan.

Line scan:

the following parameters must be present for an automatic control of the orientation:

Scan Direction Left to Right -> orientation in x-direction, no flipping
Scan Direction Right to Left -> orientation in x-direction, flipping
Scan Bottom To Top -> orientation in y-direction, no flipping
Scan Top To Bottom -> orientation in y-direction, flipping

The following parameters are read from the csv file if available:

SCAN	Length [m]	Start x [m]	Start y [m]
Line 1	4.000	0.000	0.000
Line 2	4.000	0.500	4.000

pecularity for the GP8100 system: for this system the start x and start y values are missing. Therefore the start is always set to 0.

Area scan:

The grid size will be interpreted

Grid Size - X [m]	4.100
Grid Size - Y [m]	4.100
Grid Spacing - X [m]	0.100
Grid Spacing - Y [m]	0.100

as well as the coordinates of the individual lines

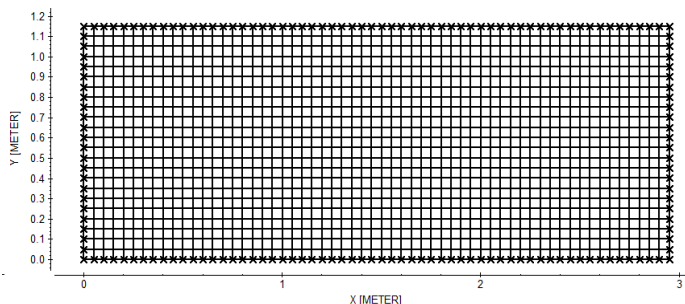
SCAN	Length [m]	Start x [m]	Start y [m]
Line 1	4.000	0.000	0.000
Line 2	4.000	0.500	4.000

For an area scan the program automatically controls whether the scan is orientated in x- or y-direction and whether the scan must be flipped by comparing the start coordinate and the grid size. In addition it is assumed that the first scans are orientated in y-direction and the last ones in x-direction. The program controls the parameter Line and reads the scan number and compares it to the number defined within the

original filename (e.g. L001).

Pecularity for the GP8100 system: as the start coordinates of the individual lines are not given no flipping will be done and the start coordinates are calculated from the grid parameters which only define the total range of the start points of the first channel of the individual scans. The coordinates of the individual 2D-lines are calculated from these start points, the relative position of the actual channel and the given length.

Grid Size - X [cm] 270.0
 Grid Size - Y [cm] 90.0
 Grid Spacing - X [cm] 30.0
 Grid Spacing - Y [cm] 30.0 ->
 SCAN DISTANCE [m]
 Line 1 1.15
 Line 11 2.95



If a gps system is available during the acquisition the Proceq system generates a second csv file containing these gps coordinates. The synchronization of the gps coordinates and the gpr data is done based on a timestamp which is stored both within the gps csv file and the SEGY gpr data. The csv file has the same name as the first metadata csv file plus a filename extension GNSS. Reflexw supports two NMEA sentences: \$GNGGA and \$GPGGA. The storing of the gps coordinates within the Reflexw traceheader is done using the option update traceheaders -> GPS-times.

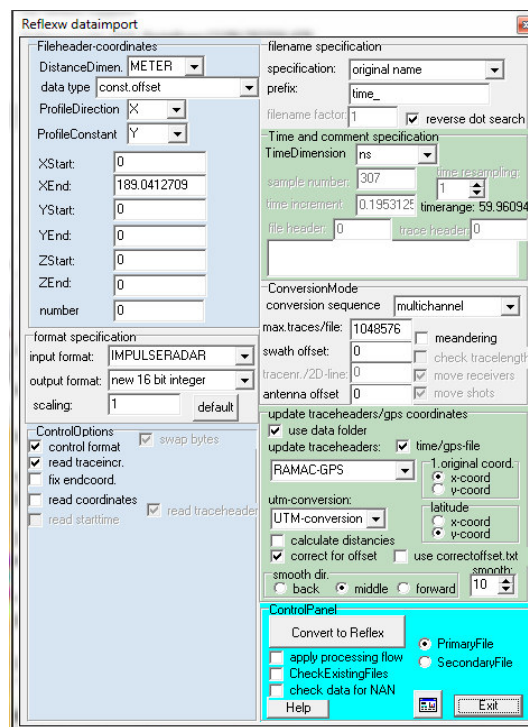
ImpulseRadar:

The ImpulseRadar program ViewR program generates a single file for all channels for the raptor system with the extension ipr and iph. The data within this file are multiplexed data containing all data of the antenna array. Multiplexed means that the sorting of the data is based on the channels (1. Trace of all channels, then 2. trace of all channels and so on).

Now different **gps-files** of the ImpulseRadar (Raptor) system are supported:

- **cor file:** this files already contains the tracenumber of gpr system and the gps coordinates are read in using the update format RAMAC GPS.

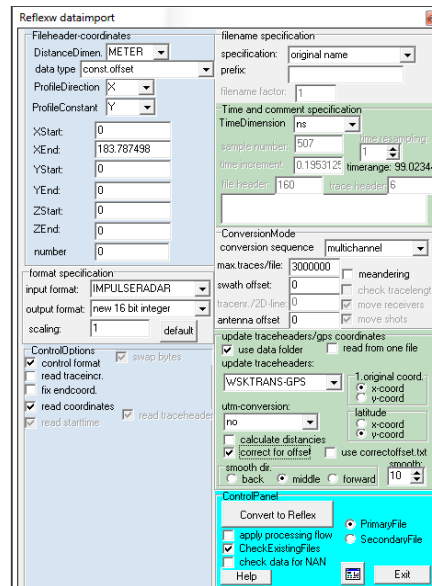
- **time/gps files:** the time file contains the tracenumber and the gps times, the gps file the coordinates and the gps times. Reflexw generates a gpss file, a modified file from the gps file which also contains the tracenumbers from the time-file. A possible latency must be included afterwards by using the option correct for offset within the edit traceheader menu or within the edit several files menu.



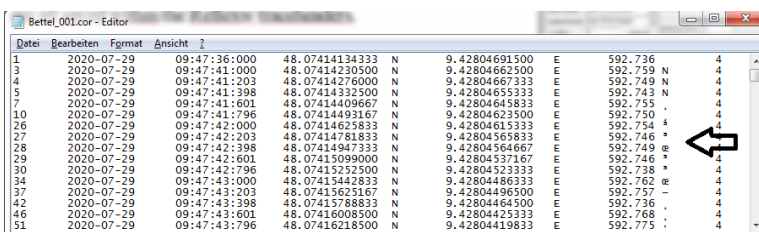
- **pos file:** is generated when exporting the Raptor data from the ImpulseRadar program ViewR. In this case only one Radar file for all channels exists with the extension ipr and iph. The filename of the pos-file as for the gpr data including _G01 and the extension pos. Use as update traceheader format WSKTRANS-GPS. If the coordinates are given in meter a utm conversion is not necessary.

- **tsp file:** The Raptor 45 with total station GPS generates a different GPS ASCII-file with the extension tsp. The format is the same as for the WSKTRANS-GPS. Normally the GPS-data are given in METER. Therefore no utm-conversion is necessary. The 1. Original coord. and the latitude must be set according to the original settings. The tsp file includes the x-, y-, z-coordinates as well as the time which are all saved within the Reflexw traceheaders when using the WSKTRANS-GPS traceheader update. A possible latency must be included afterwards by using the option correct for offset within the edit traceheader menu or within the edit several files menu.

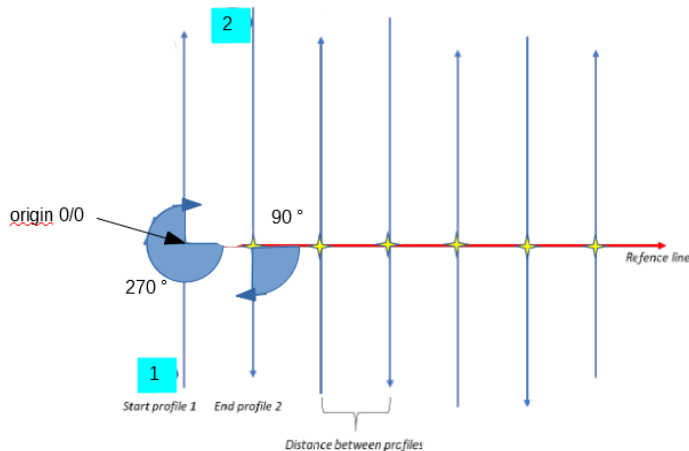
- included 01.07.2023 within ver. 10.3



ImpulseRadar cor-file: it may happen that the cor-file from the ImpulseRadar device contains strange characters which lead to an access violation error (the character is automatically interpreted as an end of file which leads to the error). A new check has been included in order to avoid this problem during reading cor-files with strange characters.

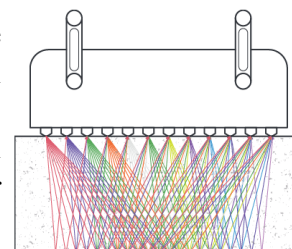


use reference line: only for **ImpulseRadar**-data. If activated the fileheader coordinates of each 2D-line will be changed according to the relative coordinates to the reference line stored within the ImpulseRadar headerfile. The original of the reference line is assumed to be located at 0/0. The constant coordinate is read from the RELATIVE DISTANCE parameter and the start coordinate is read from the RELATIVE START value given within the iprh-header file. If the value for RELATIVE DIRECTION is set to 90 (see line 2) the 2D-line is assumed to have been acquired in opposite direction and in this case an automatic flipping is done in profile direction and the start coordinate given within RELATIVE START will be changed to the end coordinate. The entered profile direction and profile constant values are used for the determination of the xy-coordinates in relation to the reference line. With Y as profile constant the reference line direction corresponds to Y and with X as profile constant the reference line direction corresponds to X.

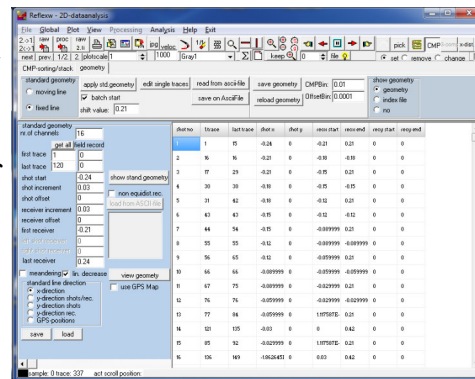


- included 07.01.2024 within ver. 10.4

ASCII-Proceq-PD80: The original data are stored using the ASCII-format of the Proceq PD 80 ultrasound device. Reflexw searches the raw data of the individual channels of the single shots. The proceq device consists of either 8 or 16 channels and allows to acquire data along a single line or perpendicular to the channel arrangement. 15 or 7 shots will be acquired within one single measurement. For the first shot 15 (7) receiver channels right to the shot position will be acquired, for the next shot only the 14 channels right to the shot, for the next only 13 ,....., for the last shot only 1 channel will be stored. No geometry informations will be taken from the original data. Only the sample number is read from the original data. The time dimension is set to micro sec be default. The timeincrement is assumed to be 1 micro second.



The data acquired along a single line may be processed in the same way like a standard 2D seismic reflection survey. The geometry may be entered within the CMP processing module (chap. 1.12.4.1). Here a special option named lin. decrease has been included which takes into account the decreasing number of channels with increasing shot number. A batch start allows to enter the geometry for different scan positions by entering a fixed shift value.



- included 01.07.2023 within ver. 10.3

Update traceheaders/gps coordinates:

- new option **smooth xyz-coord.** which allows to smooth the traceheader receiver coordinates over a selectable number of traces defined by the parameter smooth. For common offset lines the same smoothing will be done for the shot coordinates.

- included 01.08.2023/05.12.2023 within ver. 10.3

New suboption **median** - if activated the smoothing is done based on the median instead of the mean value - included within ver. 10.5

- The **original trace numbers** are now used for the synchronization of the GPS coordinates if a format was used in which the synchronization is based on the trace numbers. This allows processing steps that change the sorting or the number of original trace numbers (e.g. x-flipping in profile direction if the option meandering has been activated) to be carried out before the GPS coordinates are imported.
- included 07.01.2024 within ver. 10.4

IDS-OGPR: imports the data from the IDS OpenGPR File Format (file extension ogpr). The data are blocked and may contain several channels. The channels will be automatically demultiplexed and stored on different datafiles. The filenames will get an extension corresponding to the entered number within the fileheader coordinates panel. Example: the number is set to 0 and original name is used for the filename specification. Then the imported data of the first channel has the filename file1_00.dat and the second channel file1_01.dat.

The ogpr data also contain geolocation data x, y and z(elevation) for the different channels. These will be automatically read in and stored within the traceheaders of each Reflexw file. The original x- and y coordinates will always be stored on the x- and y-places. For that purpose a dummy ASCII file with the extension csv will be generated which also may be used afterwards for a manual control.

- included 30.01.2024 within ver. 10.4

IDS: IDS uses a dynamic header. Reflexw searches a special 4 byte value which defines the end of this dynamic header. The standard value is 267592 but newer system also use 3 different values 538976328 and 3158088 as well as 72. It might happen that this fails. In this case the option **use newer checks** must be deactivated which ignores the newer 3 check values and only uses the standard check.

- included 05.06.2024 within ver. 10.5

2. Edit fileheader:

new datatype **single shot/borehole xyz**

3. Edit several Fileheaders:

csv file from **Proceq** now supported for gps-times actualization.

New option **latency** which allows to correct a possible time delay between the gpr and the gps times. If this time delay has not been considered during the synchronization of both devices it may be corrected manually using this option. The entered latency in s will be subtracted from the times stored within the Reflexw traceheaders and this new value is the base for searching the corresponding gps coordinates which replace the old ones. Normally the latency will be given in positive values and thereby at the beginning of the gpr line no gps coordinates are present. Here an automatic extrapolation will be done. If a negative value is entered for the latency an automatic extrapolation will be done at the end of the gpr line.

New option **use fileheader dist.** within the correct for offset in profile direction type which uses the fileheader distances instead of the traceheader distances for the pure correction in profile direction (lateral offset identical 0).

A **progress bar** is shown during saving the file/traceheaders with the possibility of cancelling the saving.

Trace number based GPS-synchronization like Ramac-GPS, IDS-GPS, GSSI-GPS, UTSI-GPS and PulseEkko GPS:

- now the **original trace numbers** are used for the synchronization of the GPS coordinates if a format was used in which the synchronization is based on the trace numbers. This allows processing steps that change the sorting or the number of original trace numbers (e.g. x-flipping in profile direction if the option meandering has been activated) to be carried out before the GPS coordinates are updated. With the option **use act trace no** activated the actual Reflexw tracenumbers are used instead of the original ones. This might be useful if the gps-datafile has been created afterwards based on the new tracenumbers after any processing step, e.g. a x-flipping

included 07.01.2024, ver. 10.4

4. traceheader menu

csv file from **Proceq** now supported for **gps-times actualization**.

Ramac-GPS, IDS-GPS, GSSI-GPS, UTSI-GPS and PulseEkko GPS:

- now the **original trace numbers** are used for the synchronization of the GPS coordinates if a format was used in which the synchronization is based on the trace numbers. This allows processing steps that change the sorting or the number of original trace numbers (e.g. x-flipping in profile direction if the option meandering has been activated) to be carried out before the GPS coordinates are updated. With the option **use act trace no** activated the actual Reflexw tracenumbers are used instead of the original ones. This might be useful if the gps-datafile has been created afterwards based on the new tracenumbers after any processing step, e.g. a x-flipping

included 07.01.2024, ver. 10.4

Ramac-GPS: now also the profile cartesian coordinates ***.corc** file is supported. New options corc file within the import menu and within the edit several file headers menu.

- included 01.07.2023

New option **correct latency** within the correct for offset in profile direction type which allows to correct a possible time delay between the gpr and the gps times. If this time delay has not been considered during the synchronization of both devices it may be corrected manually using this option. The entered latency in s will be subtracted from the times stored within the Reflexw traceheaders and this new value is the base for searching the corresponding gps coordinates which replace the old ones. Normally the latency will be given in positive values and thereby at the beginning of the gpr line no gps coordinates are present. Here an automatic extrapolation will be done. If a negative value is entered for the latency an automatic extrapolation will be done at the end of the gpr line.

New option **use fileheader dist.** within the correct for offset in profile direction type which uses the fileheader distances instead of the traceheader distances for the pure correction in profile direction (lateral offset identical 0).

Calculate distances: new option **straight line from start point** - if activated the distances will be calculated as a straight line from the start point. This might be useful if the gps coordinates vary irregularly from trace to trace and if the profile was acquired along a more or less straight line - included 13.11.2023.

GPS-Import:

5. traceheader tabella

option **coordinate transformation:** new option **several files** which allows to perform the coordinate transformation automatically for a choosable number of datasets. After having clicked on start the wanted datasets are queried - included 25.04.2023.

6. Data Export:

Export format PULSEKKO - new format **Ekko_Project format**, if activated the hd file will be saved using the newer Ekko_project format.

Export format ASCII-3COLUMNS - new suboption **header line** which allows to include a header line into the exported ASCII-file.

Export format SEGY - now also the trace times will be exported if the original data are not from SEGY data.

Export format ASCII-5COLUMNS - new groupbox depths - with the option **depths** or **altitudes** activated the converted depths or altitudes based on the given velocity are written out instead of the traveltimes. If altitudes are used the reference level is automatically taken from the actual z-coordinate - included 05.12.2023.

New Export format **ImpulseRadar** with suboption generate cor-file which is also available for the Mala RD3 export - included 26.08.2024.

7. Processing:

tracenormalize: new suboption **restrict to +-1**, if activated the resulting amplitude range will be

restricted to a range between -1 and +1. The output format will be automatically set to 32 bit floating point if the original data are 16 bit integer.

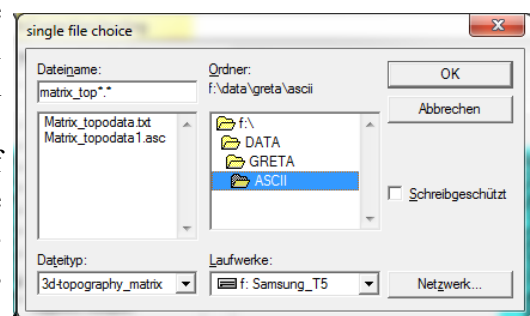
Crosscorrelation: new suboption **time cut** which allows to restrict the time range of the crosscorrelation profile

Extract: new suboption **extract coordinate/time range** - if activated the coordinate/time range defined with filterbox will be used for the data extraction. The profile start coordinate will be shifted according to the coordinate of the entered start coordinate of the extraction range. The start time will be set to the entered start time of the extraction range.

sequence processing: new option **Intermediate Process** - if activated each intermediate processing step is stored separately. This results in different output lines.

Correct 3Dtopography (ver. 10.3):

new **ASCII format** for loading the topographic values. The new format is an ASCII matrix format which contains all values in x-direction within one line. The increment between the individual values is fixed and the same for both directions. There are 5 header rows. The first specifies the number of columns, the second the number rows. The third defines the right (min.) x-coordinate, the fourth the lowermost (max) y-coordinate. The fifth column contains the increment which is negative for the y-coordinates.



```
ncols      3312
nrows      4269
xllcorner  -303320.000000000000
yllcorner  1972570.000000000000
cellsize   2.000000000000
148.796875 148.78125 148.7578125 148.7421875 148.7109375 148.6875 148.65625 .....
148.6171875 148.578125 148.5703125 148.5625 148.546875 148.53125 148.515625 148.5 .....
```

New suboption **update z-coord.only**: if activated no topographic correction will be done but only the z-traceheader coordinates are updated. The option is only useful if the coordinates are read from an ASCII-file.

The parameter **velocity** is no longer queried for depth sections.

Running average: new parameter **samples** within the taper width window which allows to enter the number of samples for tapering the time start and end.

Included 04.08.2023

correct picked phase: new option **correct z-values** - Setting 1 for the option **correct z-values** allows you to update the z-traceheader values based on the correction time values and the entered velocity.

- included 05.06.2024 within ver. 10.5

8. GPS map:

completely rewritten based on different Map services like OpenLayers, Google, Bing, Azure, TomTom, Here and MapBox.

If you want to switch between the different Map services you must have different API keys. Only the OpenLayer service does not need a valid key. If you switch for example to Bing, you should first enter the valid Bing key within the global settings menu if not already done.

new option **use depths f.colours** within the pick panel: activate this option if you want to use the colours for the depth assignment instead for the codes of the 3D-picks. The option is only for 3D-picks.

9. Picking:

new **correct** option **use correlation file**: The option allows the automatic correction of the picks based on a crosscorrelation of the actual datafile with a reference file. The precondition is that the two files have the same number of samples, traces and the same timeincrement. The option might be useful for an automatic correction of first arrivals of different files which have been acquired at the same location but at different times.

ASCII-colums export: new option **sample number**. Allows to export the sample number which is calculated from the pick traveltime and the timeincrement and start time of the actually loaded profile. - included 01.03.2023

Ascii-free format, ASCII kml file, DXF and ASCII colums: export of **depths** based on the parameter velocity - In case of already time depth converted picks the velocity will be automatically set to 2 which is identical to a transformation factor of 1. - included 02.08.2023 within ver. 10.3

10. View:

10.1 profile line (traceheader coord.) with automatic underlying of timeslices

New options **Btm/auto** and **timeslices** for the automatic display of bitmaps., e.g. timeslice bitmaps. The option auto together with Btm allows to load a series of bitmaps, e.g. timeslices which will be updated when moving the mouse cursor within the primary profile. The option may be of help when picking linear elements which are clearly visible within the timeslices. Activating the option invisible makes the control panel invisible and no axis will be displayed. This might be useful if a small window is required. Double clicking onto the interactive plan makes the control panel visible again.

The option **timeslices** allows to create the wanted bitmaps. The parameters within the GenerateTimeslices window are the same as for the option generate single Timeslices within the 3D-datainterpretation.

All profiles chosen with activated option show other lines within the show line position menu will be automatically taken over within the timeslice menu. Some new parameters have been included:

interpolate for pure x-and y-lines: if activated the chosen 2D-lines are assumed to be purely or nearly purely distributed along the x- and y-axis. In this case the interpolation will be done within 2 steps. The first interpolation is only done in x-direction for the profiles orientated into the y-direction. The second interpolation is only done in y-direction for the profiles orientated into the x-direction. Afterwards both datasets will be added.

use envelope: the envelope will be used for the generation of the timeslices

create Geotiff files: generates a tiff file together with a tfw world file containing the coordinates.

no timeslices files: no timeslice file will be generated. This is only useful if create Geotiff files has been activated

full screen for geotiff: the normal size of the tiff file corresponds to the size of the picture above. If full screen for geotiff has been activated the full size of the GenerateTimeslices window will be used for the tiff file. This allows a higher resolution.

plotscale: enter the plotscale for the display of the timeslice. If a Geotiff file will be generated the plotscale must be correctly entered here because the bitmap cannot be changed afterwards.

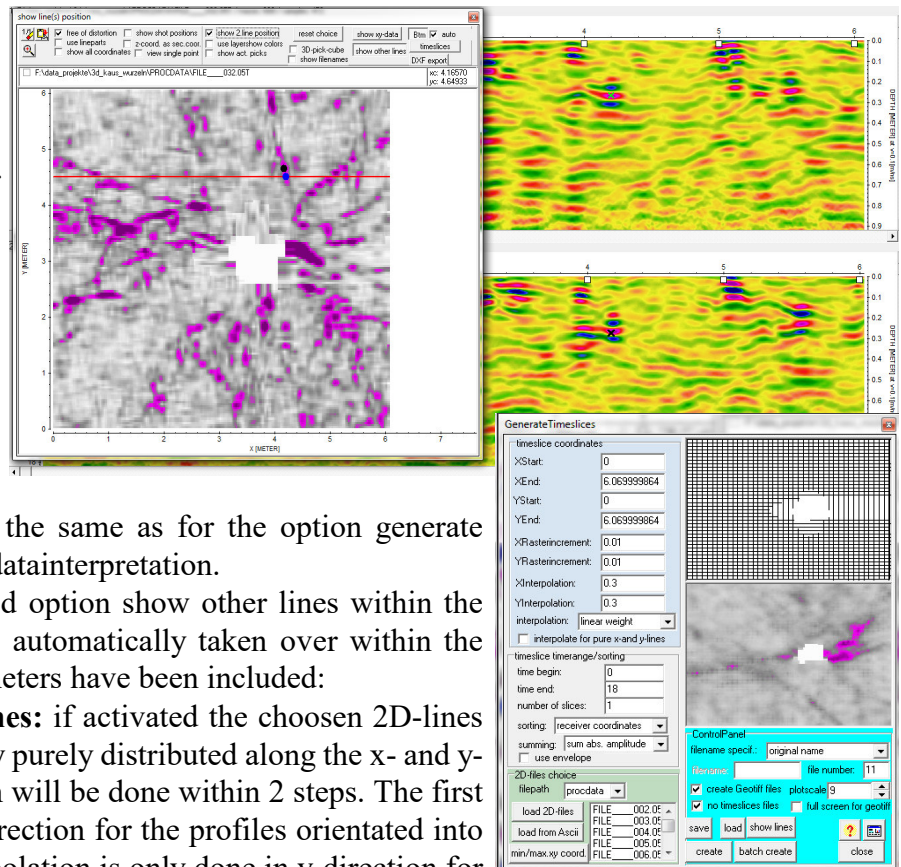
When moving the mouse within the primary profile within the 2D-dataanalysis the actual time of the mouse position is used in connection of the filenames of the bitmap in order to determine the corresponding bitmap timeslice.

Example for automatic naming:

settings: time begin: 100 msec, max. time for calculation of timeslices: 500, number: 0 - bitmap timeslice receives the name TP100000.TIF (tif bitmap) and TP100000.TFW (tfw file containing the corner coordinates) and is saved within in the directory ASCII.

Example for manual naming:

settings: time begin: 5 nsec, max.time: 50 nsec, FileName: Test - time slice receives the name



Test0500.TIF (tif bitmap) and Test0500.TFW (tfw file containing the corner coordinates) and is stored in the directory Procdata.

06.07.2023: new check included if the length of the complete filename of the bitmap files exceeds 80 characters.

05.11.2024: The option **Btm** has been modified, e.g a new option named **UseBitmapCoordinates** has been introduced. In addition a new option **manual scale** allows to redefine the coordinate range to be plotted. Again the light button may be used to show this windows if closed. Also printing now is possible.

II. 3D-datainterpretation

generate single timeslices: new option `interpolate` for pure x- and y-lines

option **show xy-proj.** within the pick panel: new option **interpolation**, if deactivated the picks will not be combined using a straight line. I activated the picks with the same code will be combined. The option `1/1` allows to replot the projected picks.

Xyz-cuts: new option **only slices** for the smoothing. If activated the smooth factor only acts on the slices and not on the x- and y-cuts.

3D-cube: new option **picks** for restricting the value range. If activated only these datapoints of the actual 3D-file will be plotted for which picks have been loaded. With the option `ViewPicks` the actual picks will be displayed.

Automatic change of the rotation angle if the option **flip-z-axis** has been changed.

Effects: new option **apply to timeslices only** - if activated the chosen effects will only be applied to the timeslices and not to the x- and y-cuts.

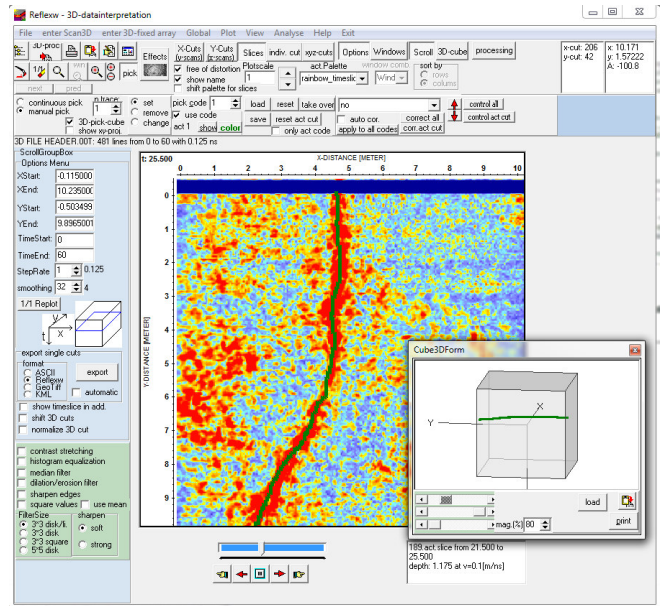
Load secondary 3D-dataset - new option **for timeslices only** within the processing form. The option allows to use the secondary 3D-file only for the display of the timeslices. For the display of the x- and y-cuts the primary file will be used. This might be useful if you use a nonmigrated 3D-dataset as primary file and the migrated 3D-dataset as secondary 3D-file. In this case the migrated dataset will be used for the display of the timeslices and for the x- and y-cut display the non migrated data are used which may allow a better detection of small objects in the form of diffraction hyperbola in some cases.

Scaling: new option within the 3Dprocessing form - enter a scaling value with which the amplitude values will be multiplied during the import. Adapting this value might be necessary because during the import the data will be stored as 16 bit integer values and consequently may fall out of the binary data representation if the original data exhibit small (e.g. smaller than 1) or very large values (greater than 32000). A corresponding data scaling value (greater 1 for small original data values and smaller 1 for great original data values) can be used in order to rescale the data in order to be able to be represented as 16 bit integer, included within ver. 10.5.

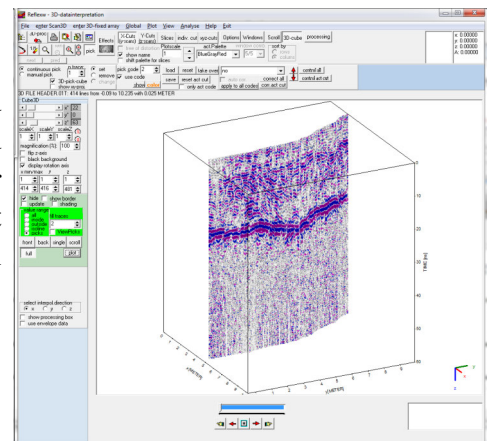
Picking a crooked target object with depth variations

Some new options allow to pick a crooked target object with a more or less linear structure and with depth variations (for example a pipe) semi automatically. For this purpose the following steps are necessary:

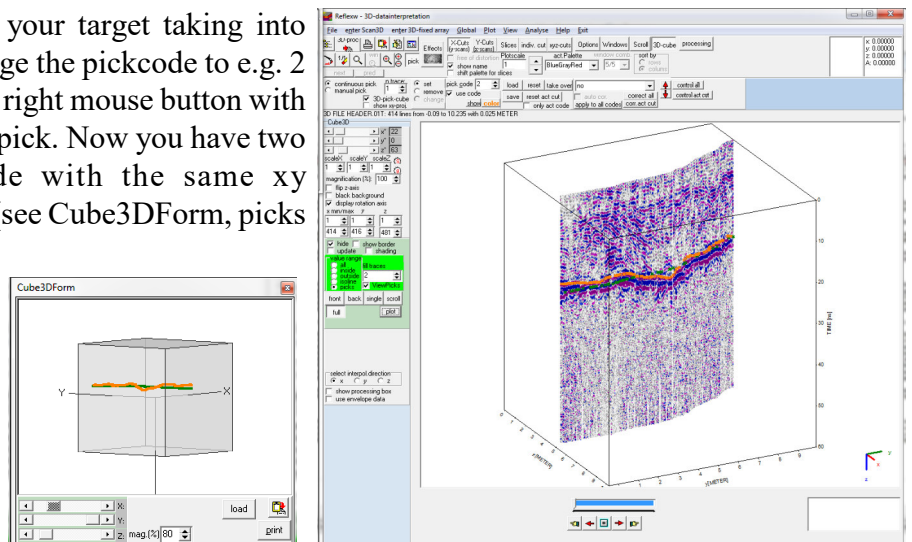
1. Choose **scroll** and activate **pick**. Choose an appropriate timeslice (a **smoothing** factor greater 1 might be useful if the target object differs in depth) and pick the object without consideration of the depth changes (see picture on the right) with activated option **use code** and using e.g. code 1. The result is the picked target showing the correct position in x- and y-direction but not in depth (see small picture of Cube3DForm, option 3D-pick-cube). Save the picks.



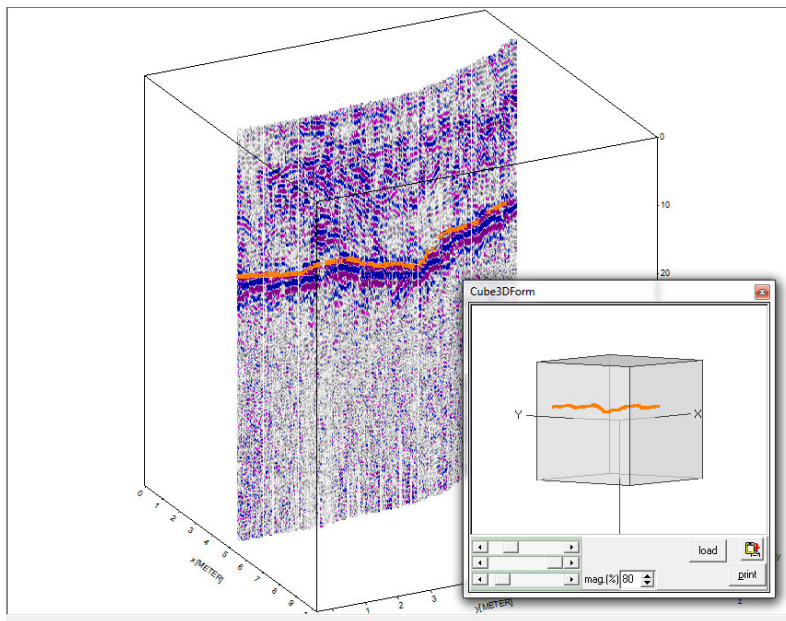
2. Activate **3D-cube** in order to only display the crooked line based on these picks. This is done by setting **value range** to **picks** and activate **full**. Now only these 3D-data traces will be plotted for which a pick has been set (picture on the right, the picks are not displayed if the option view picks is deactivated). The option **fill traces** allows you to avoid gaps because of missing pick traces. Enter here for example a value of 2 or 3 if gaps are present.



3. Now you are able to repick your target taking into account the depth changes. Change the pickcode to e.g. 2 and pick the pipe again using the right mouse button with e.g. activated option continuous pick. Now you have two pick sets with different code with the same xy coordinates but different depths (see Cube3DForm, picks in green and in orange).

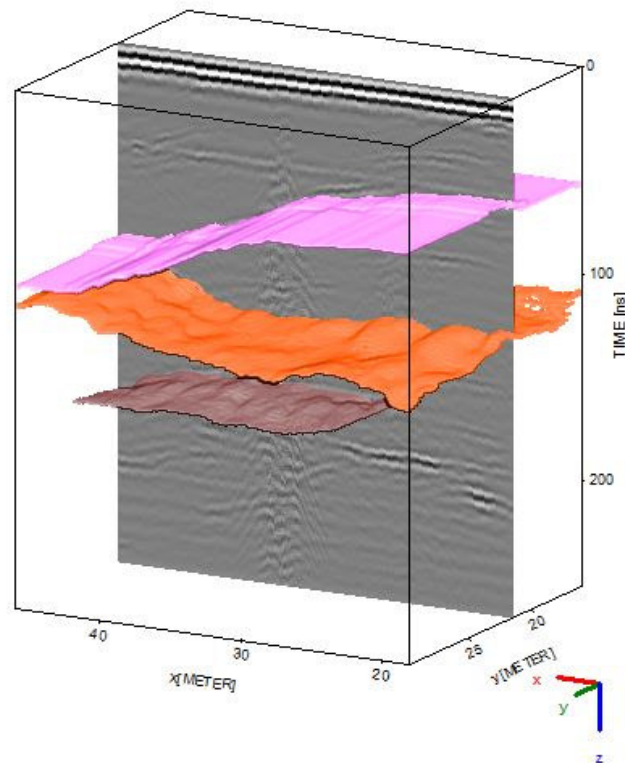
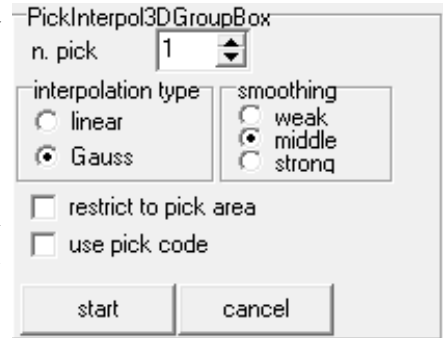


4. For the last step you may delete the picks with the wrong depth by resetting pick code to 1, activate only act code and click on reset within the pick panel. Now only the picks with code 2 are present, save the picks.



new pick option **interpolate to 3D**:

The option allows to interpolate the actual picks based on the actually loaded 3D-file. With the option **restrict to pick area** the interpolation will be restricted to the xy-range of the actual picks. This may be useful if the picked surface does not cover the complete 3D-xy range. With deactivated option the interpolation range is identical to the complete xy-range of the actual 3D-file. A new pick will be generated by interpolation from the original picks for each gridpoint within the xy-range. 2 different **interpolation types** are available - linear and Gauss. In addition 3 different **smoothing** modes are accessible. The resulting pick surface is smoother if the original picks are distributed reasonably uniformly in the x and y directions. If the actual picks exhibit an anisotropic distribution the parameter **n.pick** may be used in order to restrict the number of original picks and therefore to allow a more uniform distribution in x- and y-direction. The option **use pick code** controls if the pick code is taken into account. If activated only the picks with identical pick code form the base for one interpolation independently from the picks with other codes. Dependent on the number of different pick codes the total number of interpolated picks increases accordingly. The interpolated 3D-picks may be saved and loaded afterwards using the option `view/picksurfaces for 3D-cube`. Here different 3D-pick datafiles for different layers (marked with different pick codes) or one 3D-pick datafile containing the picked layers within different pick code (see option `use pick code`).



The definition of the intensity of the used colors for the **shaded interfaces** has been improved.

III. 3D-Scan

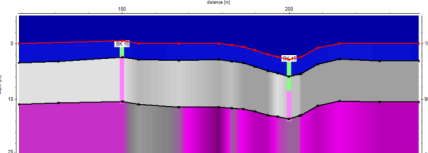
new option **no migration for xy-cuts** within the migration processing box.

New import format **SEG-PRISM**.

IV modelling

New progress bar for the FD-modelling of constant offset sections.

New option **Core data/1D models** under View which allows to display core data (1D-depth distributions) as vertical bars onto model.



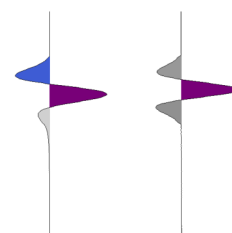
Option **analyse/generate pickfile** with activated **topography**: an error message now appears if generate pickfile (two way traveltimes) has been activated. For generate pickfile (depths) the topography itself is also output as picks. - included 01.03.2023

Option **show additional rasterfile** with activated options topography and altitude: in further versions the additional rasterfile started at the start depth defined within the fileheader - now it always starts at the top of the actual model whereby a better comparison is given if different altitude reference levels had been used for the construction of the Reflexw rasterfile and the model. - included 01.03.2023

FD-modelling:

New progress bar for the FD-modelling of constant offset sections.

New option **signal correction**: The FD calculation within a 2D-medium automatically includes an integration of the order 0.5 of the signal for a point source and of the order 1 for a plane source. In order to correct this the option **signal correction** has been included which performs a fractional derivative of the order 0.5 (point source) and 1 (plane source) onto the resulting profile. The option is only enabled if background is deactivated. The picture on the right shows a Ricker wavelet without this correction (left) and using this correction (right panel). Such a correction may also be done afterwards within the 2D-dataanalysis using the processing option differentiation with the order 0.5 or 1 respectively - included 01.05.2024, ver. 10.5.



Tomography:

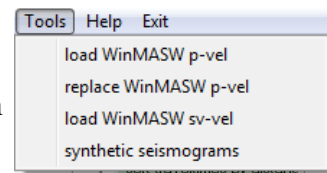
new option **No check range**: allows to set a range (in meter) on the left and on the right where the option Check no ray area is not valid. This might be useful for example for refraction data if far shots are available and here no data points are available between the shot position and the first (last) receiver position. By setting these ranges the start model will not be changed if not covered.

The **outputformat** for the **tomographic result** has been changed to new 32 bit floating point.

An advanced check has been included for removing artefacts if a topography is present. In further versions due to the rasterincrement it could happen that the option **check no ray area** did not fully work around the topographic interface and a non zero value remained. - included 01.03.2023

V CMP velocity analysis

The option **Tools** within the main menu allows:



load WinMASW p-vel: loads a p-velocity distribution derived by the program WinMASW™.

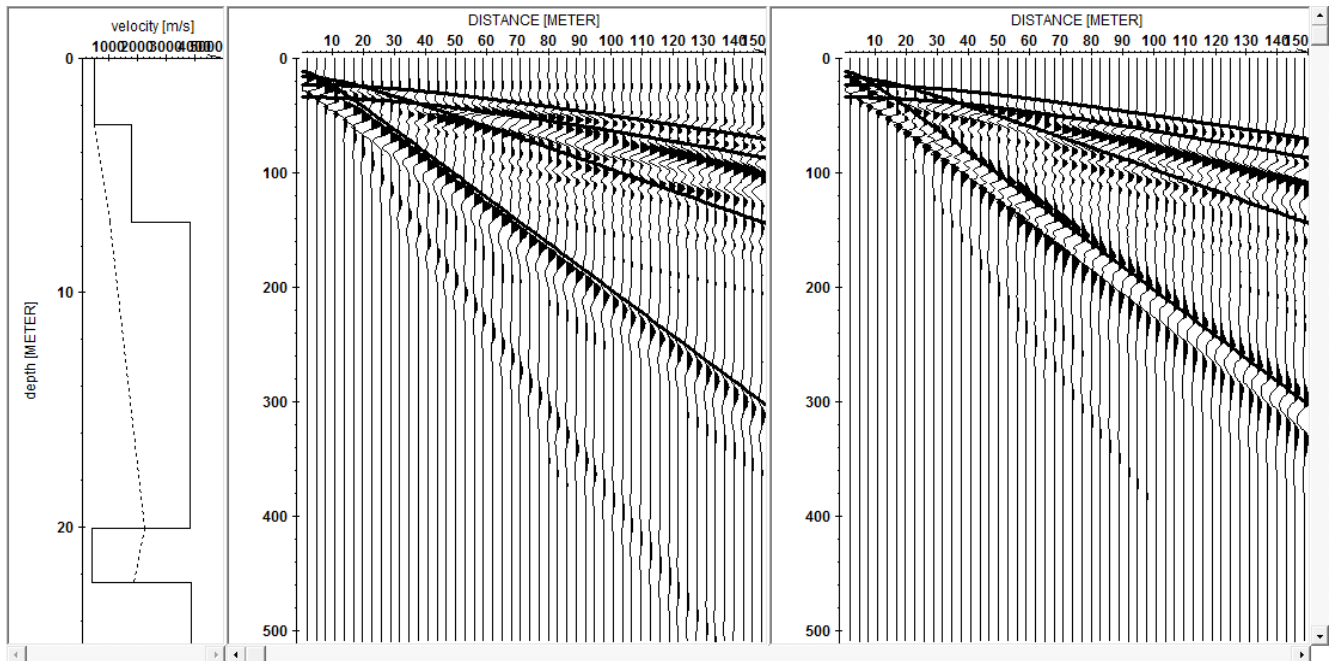
Replace WinMASW p-vel: allows to replace an existing WinMASW™ velocity file by the actual p-velocity model. The option might be useful if a surface wave analysis has been performed using the WinMASW™ program and the p-velocity distribution has been modified within Reflexw by e.g. analysing the first p-wae onsets.

load WinMASW sv-vel: loads a sv-velocity distribution derived by the program WinMASW™

1. Synthetic seismograms

The option **synthetic seismograms** under **Tools** allows to calculate synthetic seismograms based on the actual 1D-model using the Reflectivity Method (Sandmeier and Wenzel, 1986).

The method allows the full waveform simulation for a laterally homogeneous medium. It calculates seismograms for all three components (below only the simulation of the vertical and radial components are displayed).



The actual loaded velocity model forms the p-velocity base for the calculation. The s-velocities are automatically determined from these p-velocities using a Poission ratio of 0.25. The P-quality factor Q_p is determined from the p-velocity/40. The S-quality factor Q_s is assumed to be $0.75 \cdot Q_p$.

Following you find a description of the input parameters:

calculate: allows to calculate the full wavefield including conversion from P to S waves and vice versa. There is the possibility to restrict the calculation to only P reflections (PP), SV reflections (SS) or P and SV reflections but no conversions (only PP/SS).

Transm.conversion: allows to ignore P to S and S to P conversion during the transmission.

Type: allows to choose either displacement, velocity or acceleration for the type of receivers.

Ver./rad. Comp.: allows to define which component shall be calculated.

Trans.(sh) compl.: defines if the sh-component shall be calculated.

Source: different source types may be chosen.

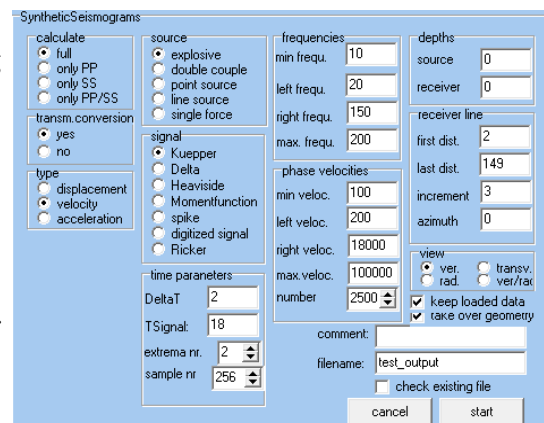
Explosive should be used if explosives had been used for the wave excitation.

Double couple should be used for an earthquake simulation.

Point source is the standard source for a small scale source radiating P-, SV- and SH-energy degree independent..

Line source simulates a source which only excites in x-z direction.

signal allows to choose any of the following different signal types: Kuepper, Delta, Heaviside,



Momentfunction, spike, digitized signal and Ricker.

The digitized signal is taken from the first trace of a Reflexw formatted datafile. A possibly existing starttime within the Reflexw file will not be considered.

Time parameters: DeltaT defines the timeincrement. Tsignal gives the timerange of the signal and together with the parameter extrema nr. the dominant frequency is defined. The dominant frequency is defined by this timerange and the number of extrema (e.g. extrema nr. set to 2 and Tsignal set to 10 ms gives a dominant frequency of 100 Hz.). The total number of samples is entered by sample nr. and with the timeincrement the total time of given ($\Delta T * \text{sample nr.}$).

The box frequencies defines the frequency range for the calculation. Four parameters must be entered starting with min.frequ. and left frequ. (Start of the plateau, between min. frequ. and left frequ. a cosine window is used). The third parameter right frequ. determines the end of the plateau and the fourth the **max. frequency (max. frequ.)**. Between these two points the filter is represented by a cosine-window, too.

The box phase velocities defines the phase velocity range for the calculation. Four parameters must be entered starting with min.veloc.. and left veloc. (Start of the plateau, between min. veloc.. and left veloc.. a cosine window is used). The third parameter right veloc.. determines the end of the plateau and the fourth the **maximum velocity (max. veloc.)**. Between these two points the filter is represented by a cosine-window, too. The parameter number defines the number of calculated rayparameters and thereby the step rate between the velocities.

Within depths the source and the receiver depths are given in m.

The receiver line box defines the first and last receiver position (first dist., last dist.) as well as the traceincrement (increment), the azimuth in degree and the number of receivers (number).

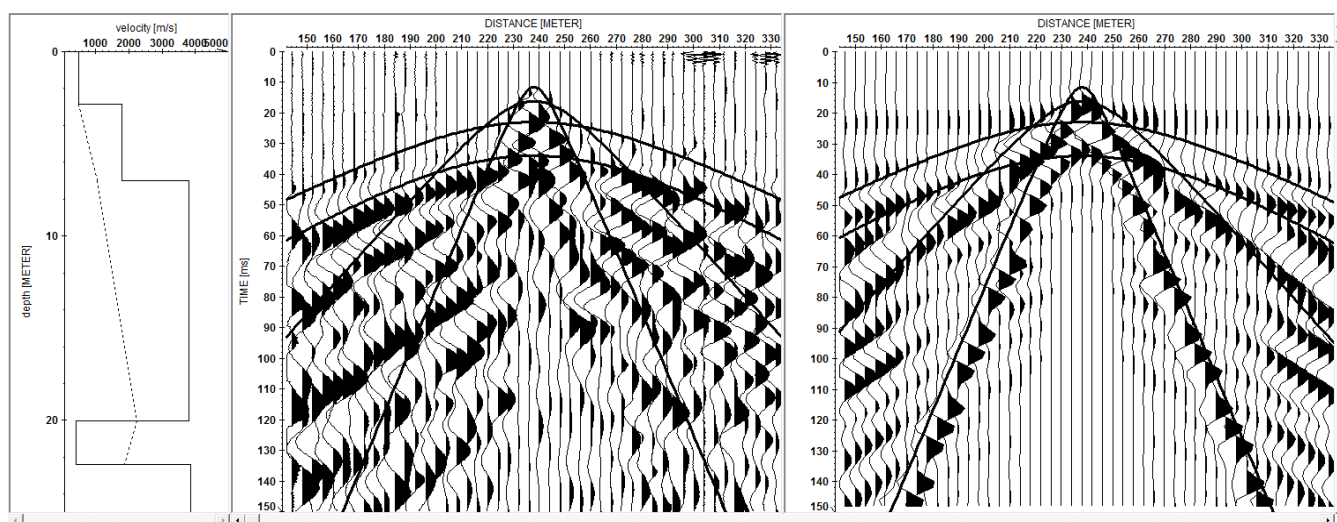
The option **view** allows to specify which component shall be displayed. You may choose between vertical (ver.), radial (rad.) or transverse (transv.) component or both the vertical and radial (ver/rad) components.

With the option **keep loaded data** activated the actual loaded data will be kept and the synthetic data will be displayed within the secondary window.

With the option take over geometry activated the geometry of the primary profile will be taken over for a direct comparison of the primary (real) data and the synthetic data (see picture below).

The Reflexw output fileame must be entered within the parameter **filename**. The vertcial components gets an extension _ver, the radial _hor and the transverse component _transv.

The calculation is started by **start**.



VI traveltimes analysis

New option **reload traveltimes** under file or the speedbutton **rel.** allows to reload the same previously loaded traveltimes pick files. Any changes within these pickfiles will be taken into account. The shot zero-traveltime will also be included if this has been activated before. The option might be useful for a fast control of any changes of the individual pick files if e.g. the seismic profile has been loaded within a second window with activated pick option.