Main news of the REFLEXW version 4.5 (24.07.2007)

0. general:

A new program named Reflex2DQuick has been released.

1. global parameters

Max. number of **processing steps** has been increased to 20 (previous value: 10).

Max. number of **samples** has been increased to 65000 (previous value: 32768).

Max. number of **layers** within the **modelling** has been increased to 200 (previous value: 50).

## I. 2D-dataanalysis

1. display

plot options: new option **overlay Pal.** which is used when 2 profiles are overlaid using the plotart pointmode. In order to overlay the 2 profiles you must deactivate the options hor. and ver.split and activate the option ShowSecondLine. To be considered: by default the option ShowSecondLince is automatically deactivated when deactivating both the options hor. and ver.split for the pointmode.
One possible application might be overlying a profile with the underground velocitiy distribution e.g. taken from a seismic refraction analysis. In this case it might be useful to activate the plotoption always each file because of the different amplitude distribution.

Pointmode palette: a new color palette will now be directly used within the 2D-dataanalysis after having created. Within the older versions a new palette must be saved first and must be chosen within the 2D-dataanalysis using the option act. palette.

DragColor: an additional possibility to interactively drag the colors is given:
- a blue panel opens (see picture on the right) which allows to interactively change the colors when moving the mouse with pressed left mouse key within the panel. Starting from the midpoint increases the contrast to the right and decreases it to the left. The color table is moved to the colors which are assigned to negative amplitude values when moving to the top and vice versa when moving to the bottom
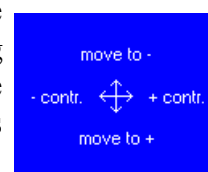
autom.scale: new option within the **plotoptions** menu which allows to automatically adapt the min./max. values for the color amplitude assignment.

Wigglewindow: new option **view sec.trace** - if activated the corresponding trace from the secondary profile will be plotted in addition using a gray color.

2. dataimport

new import format **JSF (OSI)**

SEGY:
–   if the receivercoordinates are 0 and the shot coordinates are <> 0 the receiver coordinates are automatically set to the shot coordinates.
–   shot and receiver elevation are read in
–   read start time - always in ms now even if very big start time values are present
–   With read fileheader deactivated now you may specify the data formattype manually

Radan: - min./max.marker - automatic control if 8 or 16 bit data are present. If the given min./max. Markers do not match the original Radan dataformat they are automatically set to default values corresponding to the dataformat.

3. dataprocessing

topography migration: A time migration of a two-dimensional profile on the basis of a constant velocity under consideration of a surface topography is performed. The migration automatically takes into account the different raypaths. The topography migration is useful if a strong topography is present with undulations which are comparable to the depths of the target structures. The picture on the right shows the result of the topography migration followd by the processing correct 3D-topography (the red line defines the true position of the reflector). A very good reconstruction of the reflector has been achieved.
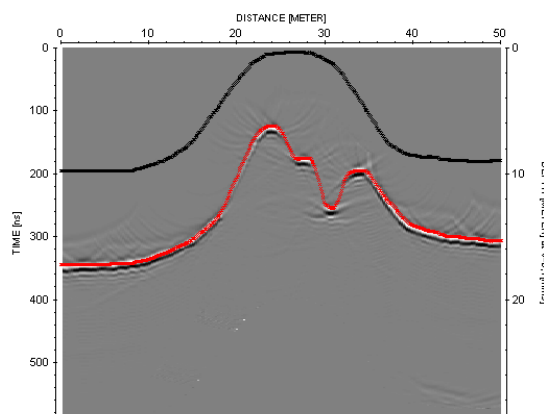
3D-fk migration: new option under migration - performs a 3D-migration based on a constant velocity which works within the frequency wavenumber domain.

conv. v to epsilon: new option under declipping/arithmetic functions - converts velocities with m/ns into epsilon values using the following formula: v=0.3/sqrt(epsilon).

corr.max.phase/wrap: new option under static correction - performs a static correction based on the max. phase corresponding to the opiton correct max. phase. In addition the data above the detected correction phase which are normally omitted are wrapped at the end (timeend) of the data. One application of the filter might be a compensation of trigger problems.

add random noise: new option under complexe traceanalysis - allows to add random noise. This might be useful e.g. for synthetic data in order to get a more realistic result. The noise is uncorrelated.

split file: new option under traceinterpolation which allows to split the original datafile into different independent files. The overall filename must be entered. An automatic labelling is added to the filename. Example with 100 different independent files: entered new overall filename: test - the new filenames will be: test0001.00t, test0002.00t,....,test0100.00t. The files are stored under the subdirectory procdata with the extension 00t.
The splitting positions may be defined either within the original profile using the left mouse key or by entering a trace number within the table input. The options read marker and read ensembles read the

splitting positions from the trace header of the original file (marker or ensemble nr respectively). A manual change is always possible. The first splitted file starts at the first splitting tracenumber (all traces before this tracenumber will not be considered) and ends one trace before the next splitting tracenumber. The last splitted file starts at the last but one position and ends one trace before the last splitting position (all traces after (including) the last splitting tracenumber will be omitted).

The option might be useful for:

- splitting a long 2D-profile (datatype: const.offset) into different partions (datatype: const.offset). In this case the profile start coordinate within the fileheader will be taken from the startposition within the original file.

- splitting a 3D-file (datatype: 3D-const.offset) into different parallel 2D-lines (datatype: const.offset): In this case the profile startcoordinate will be the same for all 2D-lines, the profile constant coordinate will be changed based on the given lineincrement.

- splitting a several shot file (datatype: several shots) into different shots (datatype: single shot): In this case the shot position as well as the start and end receiver position of the splitted shots will be taken from the traceheaders of the original file.

surgical muting: new option under static correction/muting which facilitates the muting below or above trajectories of a given velocity.

1: Inside mute - edit data between trajectories defined by VEL1 and VEL2.

2: Top mute - edit data above mute trajectory defined by VEL1.

3: Bottom mute - edit data below mute trajectory defined by VEL1.

4: Around mute - edit data around trajectories defined by VEL1 and VEL2.

correct 3D- topography: now the calculated max. topvalue is written out within the processing flow for information

gain processing options: distance range box in order to restrict the distance range for the application of the filter.

multiplication processing option: distance range box in order to restrict the distance range for the application of the filter and start time and end time.

manual gain(x): new suboption get factors for 3D-file which allows to automatically generate scaling factors for the individual 2D-ensembles of a 3D-file. The options start window and end window define the time range for calculating the scaling factors. The option might be useful to compensate different coupling conditions during the acquisition of a 3D-file.

option move: now allows save and load and sequence processing

option markerinterpol: new suboption keep all dist.markers if activated the distance markers which have not been used for the marker interpolation will be kept within the processed file. If deactivated the non used distance markers will be lost within the processed file.

It is now possible within the sequence processing to read the markerincrements from a profile markerfile with a filename correspnding to the profile filename (without extension, option read from profile markerfile). The option batch save generates ASCII markerfiles for a series of profiles for such a subsequent sequence processing. You only have to manually redefine your (nonequidistant) markerincrements within the ASCII markerfiles.

3. edit comment markers

New option **cur. picks** under the create box which converts the current picks in comment markers. The individual comment is automatically determined from the picknumber and a given <u>start no.</u>.

4. traceheader tabella

New option **interpolate** which allows to interpolate between two given coordinates.

New option **source <-> receiver** which exchanges the shot and receiver coordinates.

New option **project on x-coord.** which calculates the distancies along the line based on the receiver coordinates and projects these distances onto the x-axis - the x-receiver coordinates are set to these distancies and the y-coordinate is set to 0. The distance of the shot is also automatically determined and the shot x-coordinate is set to this distance. The start distance is queried after having activated the option. If the end-coordinates are smaller than the start coordinates an automatic flipping in profile direction is done before calculating the distances. The option is also available within the traceheader menu.

New option **topography (x,z values)** which reads the topography (shot and receiver z-values) from an ASCII-file. Each line of the ASCII-file contains the distance and the depth or elevation. The option allows the independent input of the topography for the shot and the receiver coordinates (options update shot z-pos. and update receiver z-pos.). With activated option use x-traceheadercoord. the x-receiver traceheader coordinate (rec-x) is used and with deactivated option the distance within the traceheader is used. A linear interpolation or extrapolation is done where no values are defined within the ASCII-file. The option is also available within the traceheader menu.

5. pick

New option **change pick-pos.** within the add.options panel. With change pick-pos. activated it is also possible to change the distance posititon of existing picks.

load: new format ASCII-pick diff. which corresponds to the format used for saving the picks with the pickformatASCII-Pick difference

New option **undo** which undoes the last pick action. This means for example that in continuous mode it would undo all of the picks made while the mouse button was held down.

Now the option **use layershow-col.** is always enabled. With the option activated and the use code button deactivated the picks will match the layershow colours based on the given layernumber when loading an existing pickfile.

6. Layershow

New option **export** which allows the export of the layershow into
a. an **ASCII modelfile** - this file can be imported within the modelling module using the option file/load from ASCII. To be considered for GPR-data: the wave type must be set to electromagnetic before importing the ASCII-file. Then the velocities within the ASCII-file are automatically converted into epsilon values.

b. a **Reflexw rasterfile** containing the layershow velocities if theoption rasterfile has been activated. The size of the rasterfile is controlled by the options x-points and y-points. By default the values are set to the sample and scan number of the original file. The rasterfile will be stored under the directory rohdata. If a rasterfile containg the epsilon values is wanted the option conv. v to epsilon under declipping/arithmetic functions allows to convert the velocities into epsilon values. The rasterfile may also be used for example in order to do a timedepth conversion. In this case the layershow should have been created using layer velocities and for 2D-velocity file rasterfile layer should be used.

create layershow:

- new option < comments > - if activated the interpolation or extrapolation of an upper layer (option interpolate layer active) is only done within those comment marker distance ranges where the upper layer really exists. The option is useful for example if the comment markers define construction changes with different layering. A comment marker distance range is defined between two successive comment markers and from the profilestart to the first marker and from the last marker to the end of the profile. If no comment markers are present the whole distance range of the profile will be used. If deactivated the inter- and extrapolation is done over the complete distance range of the profile.

create report:
- xy-coordinates extended to xyz-coordinates
- new option batch create - allows to generate reports for a choosable number of layershows, the current parameters are used for all reports
- statistic summary also available for summary comment data. The program calculates the standard deviation of the thicknesses of the individual layers even if the output is depth.
- xyz-coordinates also available for summary comment data.
- new option calculate thicknesses from average depths which controls how the thicknesses are calculated for summary comment data.

II. 3D-datainterpretation

open second 3D-file: new option **overlay** within the Ref3DProcessing menu. The option allows to overlay the secondary 3D-file. The chosen processing option for the primary 3D-file controls how the overlaying is done. With the option no or abs. amplitude activated the two 3D-files are simply added for all 3 cuts. With the option envelope and envelope timeslices only a a special algorithm is used for overlaying all cuts (option envelope) or the timeslices only (option envelope timeslices only). The option might be useful for a combined interpretation of two 3D-files with different antenna polarization (GPR-data) or with different orientation of the original 2D-lines.

scroll mode: new option Reflex 2D-file which allows to generate a Reflex 2D-file of the actual 2D cut.
New options **contrast stretching** and **histogram equalization** which allow to improve the contrast in the image by `stretching' the range of intensity values. The options are also available for the Windows mode.

3D-cube display: new option flip z-axis. With the option activated the z-axis will be flipped. This automatically exchanges the x- and y-axis.

III. Traveltime analysis

New possibility to directly integrate **topographic values** during the wavefrontinversion for the uppermost layer 1. Activating the option topography within the CombinePanelLayer1 panel allows to automatically read the topographic values stored with the actual picks (this also automatically activates the topography option within the modelling menu). These topographic pick values may come from the original seismic data or after having applied the option apply xz-topography under edit. The option altitude controls if the topographic values are depth values (option deactivated) or altitude values (option activated). The reference level defines the reference level for the altitudes. The depth axis is 0 at the reference level (see also option reference level within the model menu) - therefore the reference level should be set at least to the maximum existing altitude value. The depth values are calculated from reference level - altitude values.

IV. modelling

1. input of model parameters menu:

transition - new option: if activated the actual model boundary is assumed to be rather a transition zone than a sharp boundary. The size of the transition zone may be entered within the option size of transition zone. The transition zone is centered at the original position of the model boundary. Using the transition option might be useful for a subsequent tomography with a start model with boundaries resulting from a previous wavefront inversion.

import (xz) - if the option altitude is activated the z-values within the ASCII-file define altitudes and not depths for layer 1 (option topography must be activated in addition). The reference level should be set at least to the maximum existing altitude value. The depth values are then calculated from reference level - altitude values.

2. file and edit

load datatraveltimes: new options within the global settings menu which control the sorting of the traveltimes :
new option **use code for discr.** - if activated the codes stored with the picks are used in addition for the discrimination of the traveltimelines. Activate this option for example if different pickfiles for one shotpoint (e.g. refractions and reflections) are loaded or calculated. Then the code stored with the picks is used in addition to discriminate the traveltimelines (the picks with different codes are not combined using a line). The option is also available for the traveltimeanalysis menu.
new option **max.diff. for traveltimelines -** enter a distance value for the discrimination of the traveltimes which will be combined with a line within the modelling menu. The option might be useful for example if two traveltime branches for one shot have been picked but the picks are missing in the neighbourhoud of the shot. Enter a value smaller than the distance of this gap in order to prevent that his gap will also be combined by a straight line.

Exchange x-y-coordinates from datatraveltimes: normally the program uses the x-shot and x-receiver coordinates for displaying the datatraveltimes. This option allows you to use the y-shot and y-receiver coordinates instead. First you have to load the datatraveltimes (option file/load datatraveltimes). Then use this option in order to display the data based on the y-shot and receiver coordinates. The option might be useful if you have acquired two perpendicular refraction profiles and you entered a y-geometry for one of the profile (remark: this is normally not recommended because all refraction interpretation tools are based on the x-coordinates).

mix rasterfile with with lower layer boundary: allows to combine an existing rasterfile with the lowermost layer boundary. A new Reflexw rasterfile with the filename specified under rasterfilename will be generated which contains the same values as the old rasterfile except at the rasterpoints below the lowermost layer boundary where their physical parameters are used. The option might be useful for example if a lowermost reflection has been interpreted (option adapt reflector) based on a rastered overburden (e.g. from a tomographic inversion).

3. tomography:

Now the program automatically controls if 2D or 3D-tomographic data have been loaded (old option

use 2D-data has been omitted). In addition the data are sorted after shot and receiver distances. Within the old version depending on the primary sorting of the traveltime data the tomographic result could be slightly different even if using the same tomography parameters (only if curved rays has been activated). Now this does not occur any more.

fix 1. layer - new option: if activated the velocities for the first (uppermost) layer will not be changed during the tomographic inversion.

based on iter. model - new option: controls if the max. change value refers to the actual iterated model or to the start model.

view data - new option: if activated the loaded traveltime data are automatically displayed.

4. raytracing:

reflections - new option: if activated the reflections from the individual layers are calculated in addition using the FD-Vidale raytracing. It is possible to simulate the traveltimes for a single shot, for several shots with the geometry given by the data traveltimes and for the type exloding reflector which allows to simulate the zero offset traveltimes from the individual reflectors within one step.
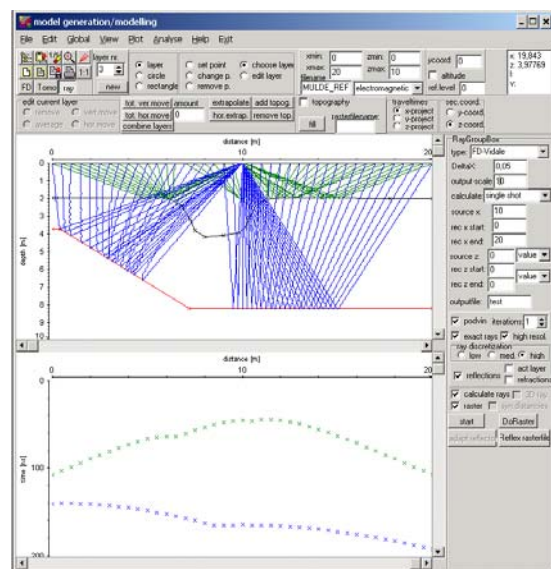
adapt reflector - new option: allows an automatic correction of the reflector depth by comparing the calculated and the synthetic reflection traveltimes.

5. rastering:

The format for the rasterfile has been changed in order to allow a higher dynamic range for the parameters:

FDP and FDS-files: 10F12:4
FDD-files: 10F12:8
FDQ and FDI-files: 10F12:5