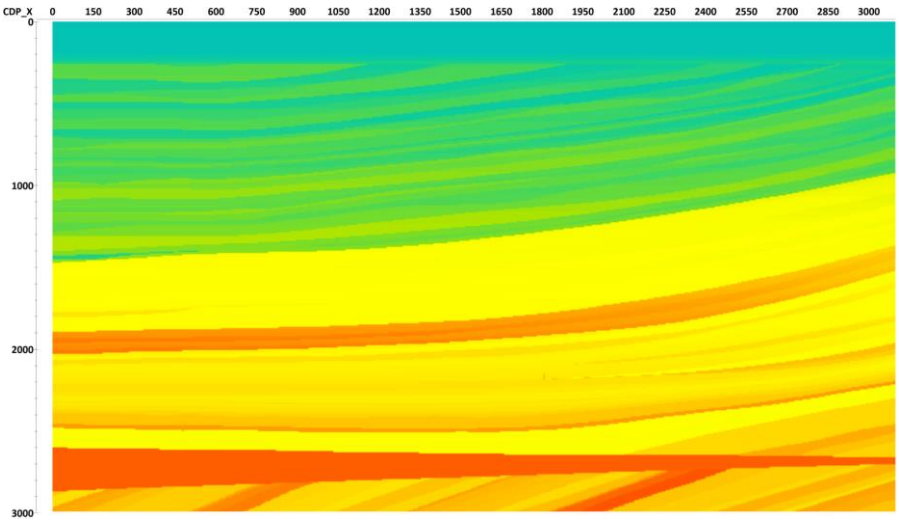
RadExPro 2024.1 release notes

Welcome to the first **RadExPro** release of the year -- **RadExPro 2024.1** !

Here is the list of the main novelties and improvements:

- New **2D VSP/Crosswell Kirchhoff Depth Migration** module performs depth migration of 2D VSP or crosswell seismic data. It extends the functionality of an older 2D-3D VSP Migration module to accommodate laterally variable velocity models. Additionally, it introduces new capabilities, including the migration of crosswell data and the migration of multiples.

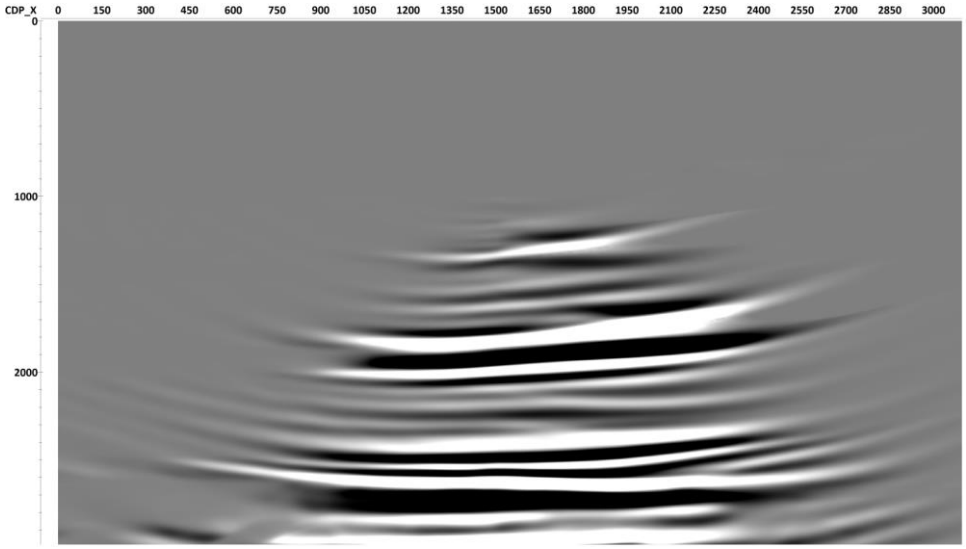
  Below we show a few examples of different migrations which can be conducted with this module. These examples are based on a synthetic seismic dataset computed in the Marmousi model by finite-difference modeling:



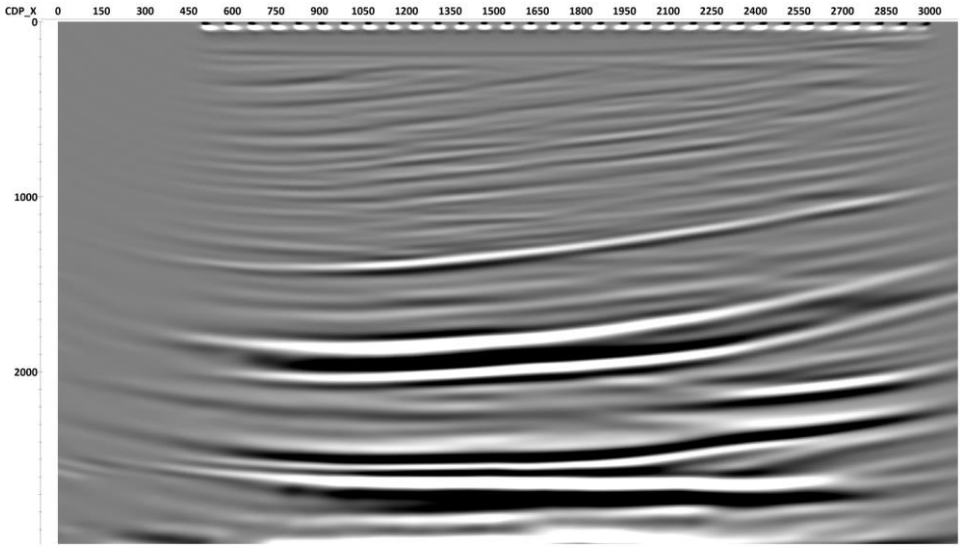
Model used for the generation of synthetic data

  Note that the vertical axis in the depth migration results is depth, so the migration results in all the below examples are shown in depth domain.

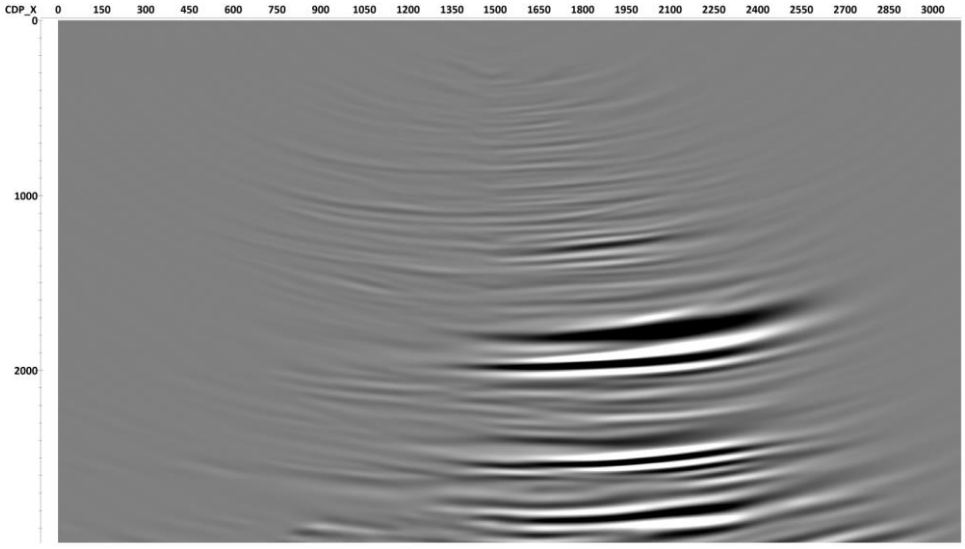
Walkaway VSP data:



P-P reflected wave migration result

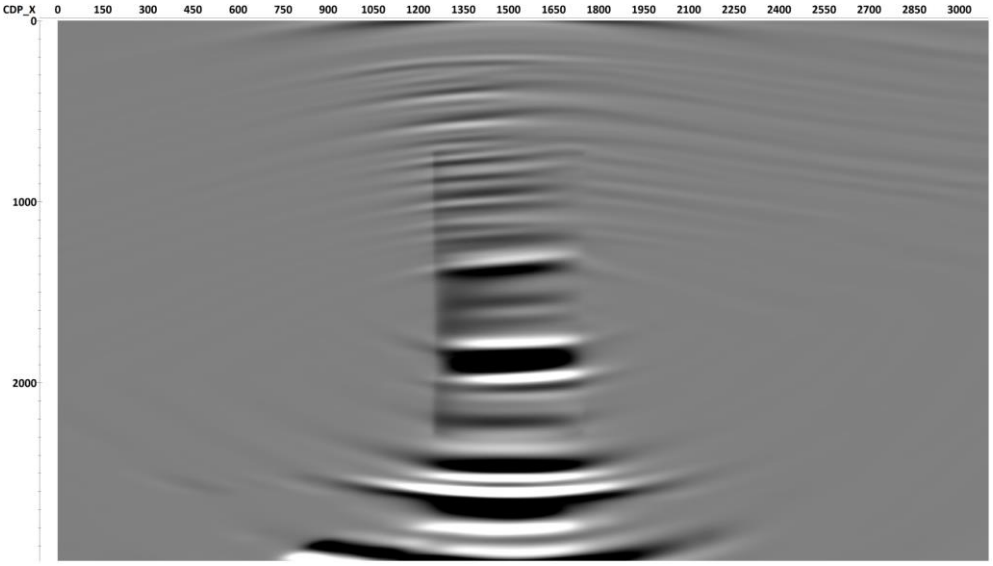


Ghost wave migration result (note improved coverage)



P-S converted wave migration result (note improved resolution)

Crosswell data:



Crosswell migration result (sum of separately migrated upgoing and downgoing wavefields)

- We have improved the functionality of the **Time/Depth Conversion** module. Now you can explicitly select the conversion methods:

    1. *Depth integration* – The depth of each sample (*i)* is computed as the depth of the previous sample plus the depth increment at this sample, calculated as:

        D(i) = D(i-1)+(dt/2)*Vinterval(i)

        The interval velocities are defined at the bottom of each interval (layer), i.e., at the points where the initial velocity function was picked. They are considered constant within each layer.

    2. *Using average velocities with linear interpolation* – The depth of each sample is computed as its time multiplied by its average velocity. Average velocities are defined as the depth of the boundary divided by the reflection travel-time. They are calculated from the interval velocities at the bottom of each interval (layer). Between the layer boundaries, the average velocity values are linearly interpolated. This method would be equivalent to depth integration if the interval velocities were initially defined at each sample.

    3. *Using RMS velocities with linear interpolation* – The depth of each sample is computed as its time multiplied by the corresponding RMS velocity. RMS velocities are initially defined at reflected boundaries only, where the velocity function was picked. Between the boundaries, the RMS velocity values are linearly interpolated. Using RMS velocities directly for time-to-depth

conversion is not precisely correct, though sometimes used. We keep this method of conversion mainly for backward compatibility only.

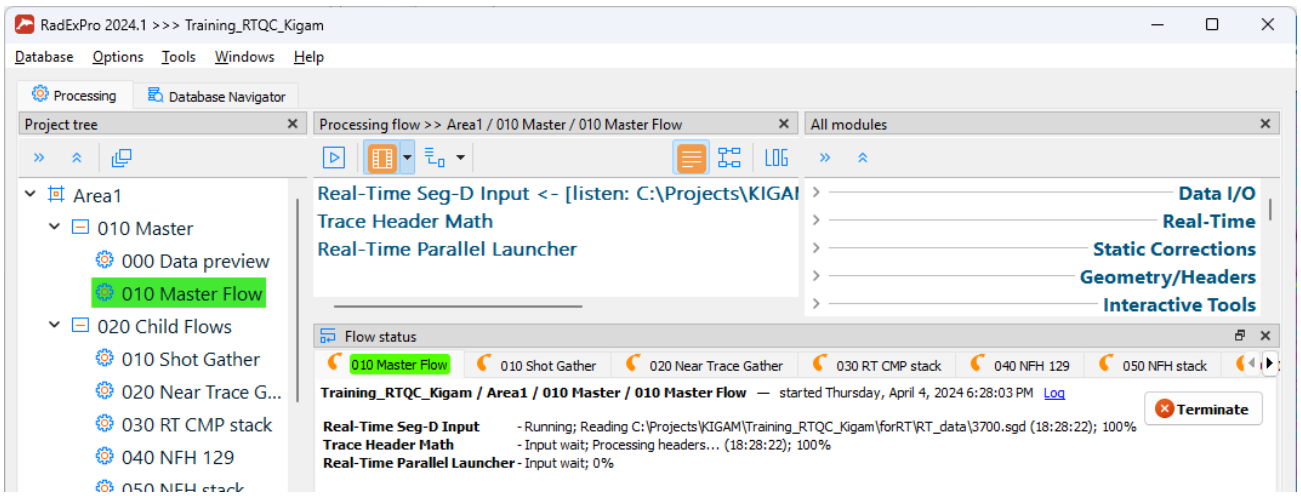
The result of the conversion does not depend on the type of the velocity function anymore, only on the selected conversion method.

- Improved **Structural Smoothing** can now process input data by ensembles. In this mode, the module processes each input gather separately without mixing them. Ensembles can also be processed in parallel, potentially resulting in significantly faster computations.
- New **Header Statistics** module calculates a number of statistics for a set of selected trace headers. The result is output either to the log file of the flow or to a specified ASCII file on disk.

Header name	Min value	Max value	Abs min inc	Abs max inc	# Zeros	# HeaderNoValues	# NaNs
PICK1.....	inf	inf	-	-	0	0	0
PICK2.....	inf	inf	-	-	0	0	0
STAT1.....	nan	nan	-	-	0	0	192
STAT2.....	HeaderNoValue	HeaderNoValue	-	-	0	192	0
FFID.....	1825	1910	0	50	0	0	-
CHAN.....	1	48	1	47	0	0	-
dt.....	0.0625	0.0625	0.0	0.0	0	0	0
CHAN_NAN...	1.0	48.0	1.0	47.0	0	0	1
FFID_HNV...	1825	1910	0	25	0	48	-
REC_STAT3..	0.0	1100.0	0.0	1100.0	7	0	0
AAXFILT....	0.0	0.0	0.0	0.0	192	0	0

Output of the Header Statistics module

- Improved **Trace Header Math** module no longer allows division by zero. If such an event occurs, the flow is terminated, and the error is reported in the log. This prevents less obvious issues associated with unexpected infinite values resulting from occasional zeros in the header that is used as a denominator in formulas.
- Improved **Derive Match Filter** – an issue in the *No Sum* mode was fixed, the overall computation speed was significantly increased.
- The speed of opening a **dataset selection dialog** (or switching to the **DB Navigator** tab of the main window) for projects with a large number of datasets (>50) was significantly improved.
- A new stack mode has been added to the **Ensemble Stack** module – *No normalization*. When selected, the resulting sample of an output trace will be the direct sum of the corresponding samples of the traces being stacked without any normalization.
- Now when you set a color of a processing flow in the project tree and run the flow, the corresponding tab of the *Flow status* panel will be colored accordingly:



(If you don't like it, you can switch this option off through the flow context menu in the project tree).

- We have made the **list of default headers** shorter by removing some technical headers required for *FairField Rotation*, *3D Regularization* and a group of *SRME* modules. The required technical headers will be created automatically now when you run the module for the first time.

- We have transitioned several modules to the new universal parameter style. These modules now offer full support for replicas and include standard export/import functionality. The affected modules are as follows:

  2D SRME Interpolation

  2D SRME Prediction

  2D SRME Geometry Return

  Apply Statics

  Super Gather

  Time-Depth Conversion

The following issues were fixed:

- Predictive Deconvolution crashes the software when a header with start time or prediction gap captains *-inf* or *NaN* values, without any error message in the log -- **FIXED!**
- TFD Noise Attenuation (manual) output traces sometimes contain *NaN*s -- **FIXED!**
- SRME prediction flow in some cases may output fewer traces than expected -- **FIXED!**
- A processing flow with more than 64 modules never terminates -- **FIXED!**
- FX Predictive Filtering doesn't run in parallel when the number of frequency samples is less than 400 -- **FIXED!**

- While converting a velocity table to trace using the module "Velocity Table -> Trace Transfer" while using any 2023 version, the output dataset does not have any information on the headers -- **FIXED!**
- Amplitude spectrum in Trace Math Transforms module in the latest versions of the software does not display frequency scale correctly, but still displays the time scale instead -- **FIXED!**
- Memory leaks in QCViewer, Seismic Display and SSAA modules -- **FIXED!**

As always, if your licenses are under maintenance, feel free to contact us at support@radexpro.com to receive your complimentary update.