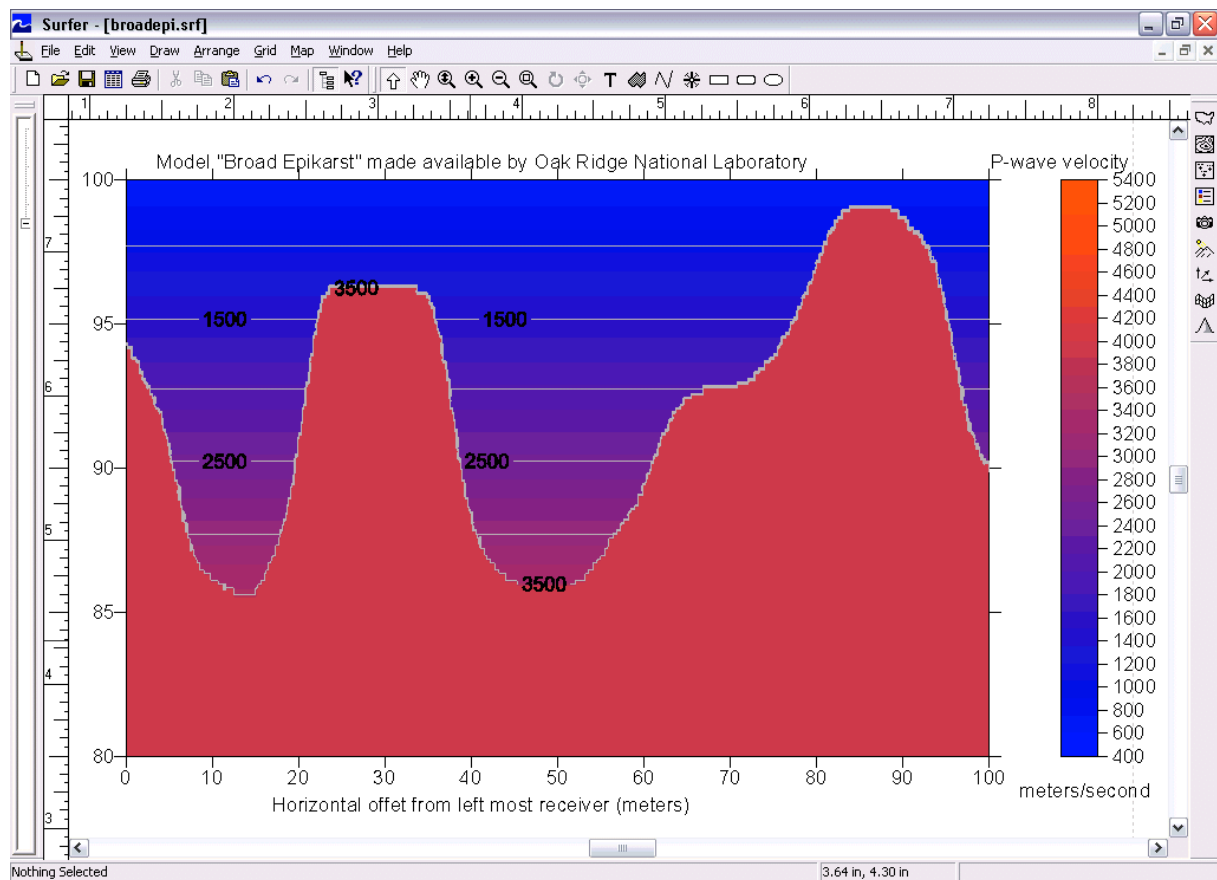


Comparison of pseudo 2D Delta-t-V initial model with 1D gradient initial model, with synthetic data set “Broad Epikarst” as made available by Jacob Sheehan, Oak Ridge National Laboratory :

Model “Broad Epikarst” as made available by Oak Ridge National Laboratory :



Download files BROADEPI.GRD, BROADEPI.PAR and BROADEPI.ASC from our web site :

<http://rayfract.com/tutorials/broadepi.zip> . BROADEPI.ASC lists 25 synthetic shots into 48 receivers.

Now create a new Rayfract™ profile database named BROADEPI, as described in our manual as available at

<http://rayfract.com/help/manual.pdf> . Specify a station spacing of 2 meters, in Header|Profile.

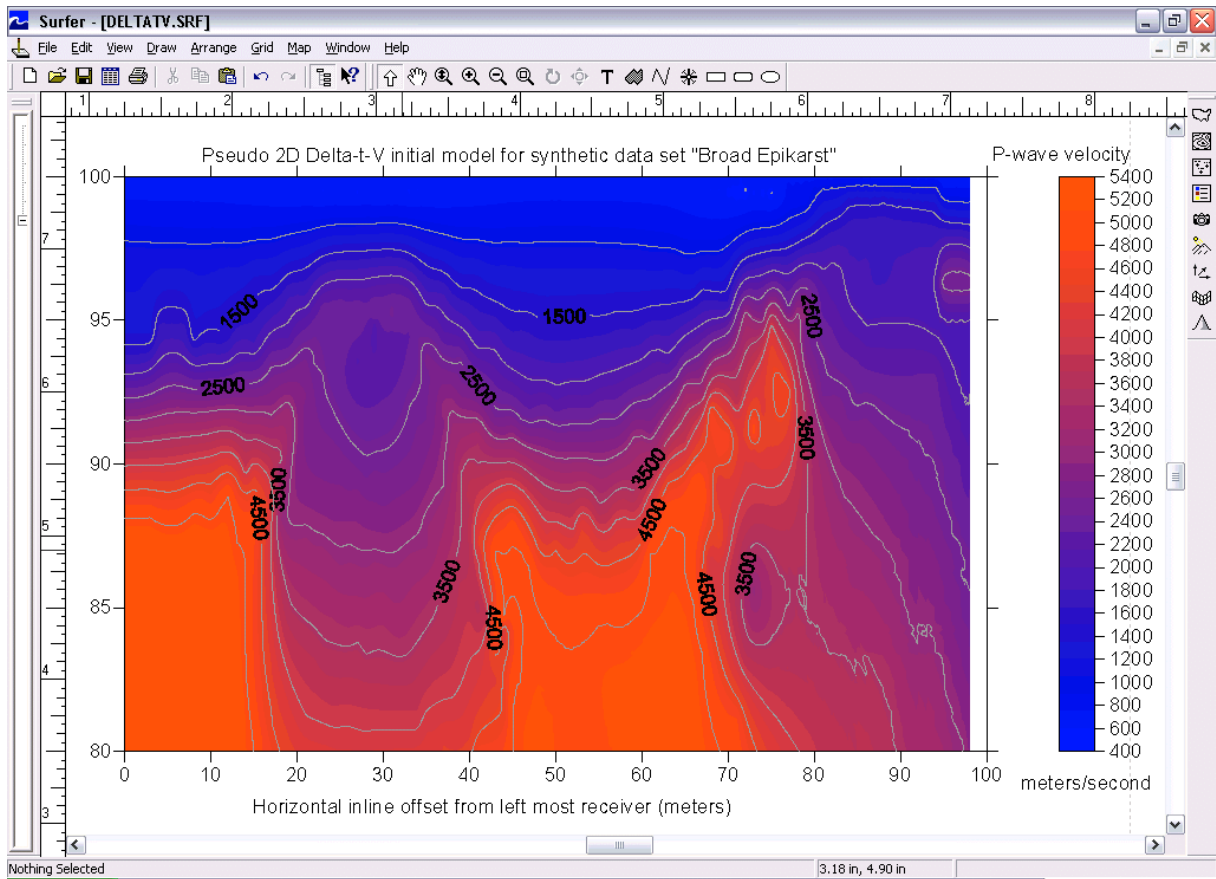
Then copy file BROADEPI.ASC into directory \RAY32\BROADEPI\INPUT, and copy files BROADEPI.GRD and BROADEPI.PAR into a new subdirectory \RAY32\BROADEPI\MODEL.

Now import ASCII .ASC file BROADEPI.ASC into profile database BROADEPI, as described in above manual. Specify import data type ASCII column format, and use the default receiver spread type 02: 48 channels. Check option “Batch import”, so you don’t need to confirm layout start and shot position etc. for each individual shot. Select Header|Station and enter a value of 100.0 for “z”. Confirm with ENTER, and confirm the prompt. Now process this data set with **Delta-t-V|Automatic Delta-t-V and WET inversion**.

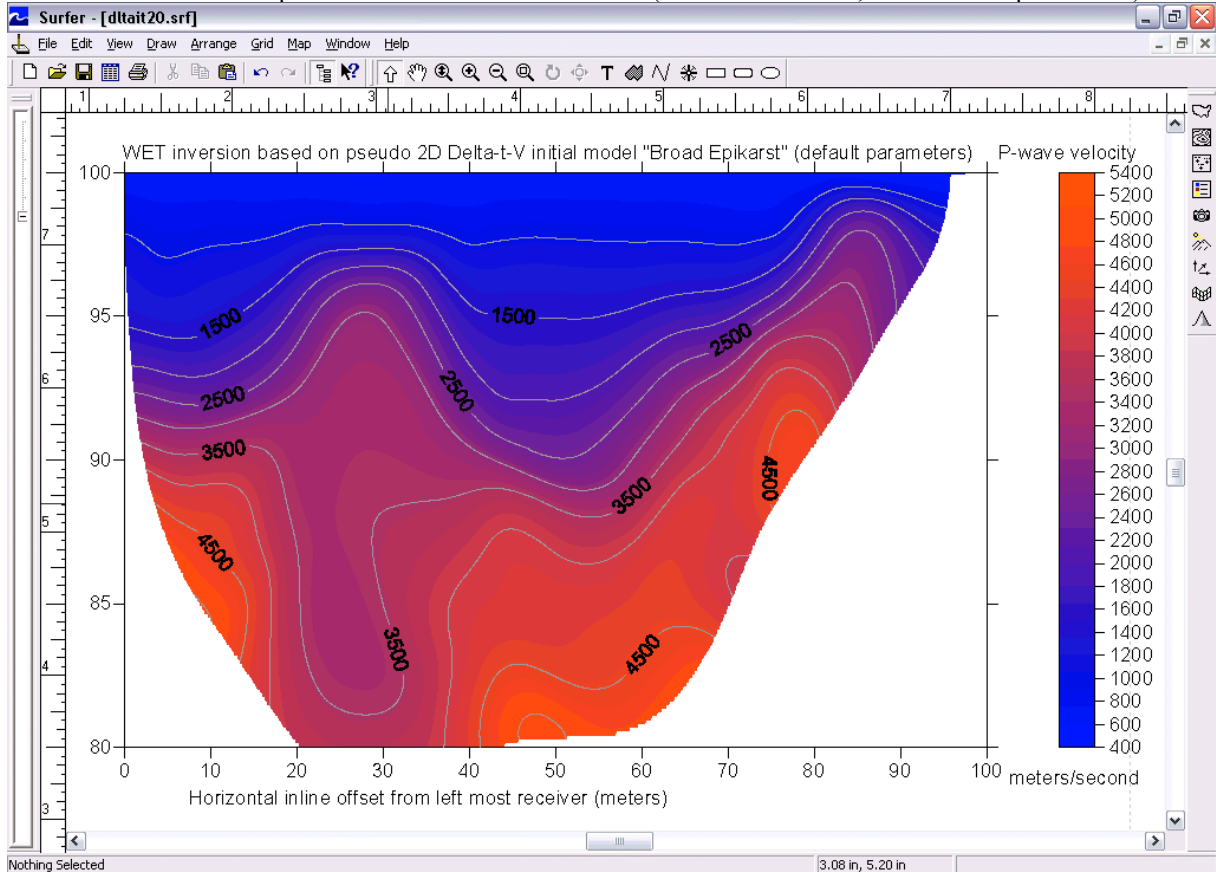
At the top of next page, we show the pseudo 2D Delta-t-V interpretation as obtained with default parameters. Note how the velocity as shown at the location of basement anticlines (horz. offsets 30 meters and 85 meters) is systematically too low. Also, the velocity below basement synclines (horz. offsets 15 meters and 50 meters) is systematically too high. This can be explained by CMP refraction theory; see our online help as available in menu Help of our Rayfract™ software and at <http://rayfract.com/help/rayfract.hlp>. Search for help topic “Strong refractor curvature”.

At the bottom of next page, we show WET output as obtained after 20 WET iterations, based on above pseudo 2D Delta-t-V initial model. Note how above Delta-t-V processing artefacts (unrealistic velocity anomalies) in the basement have been largely removed, but not completely.

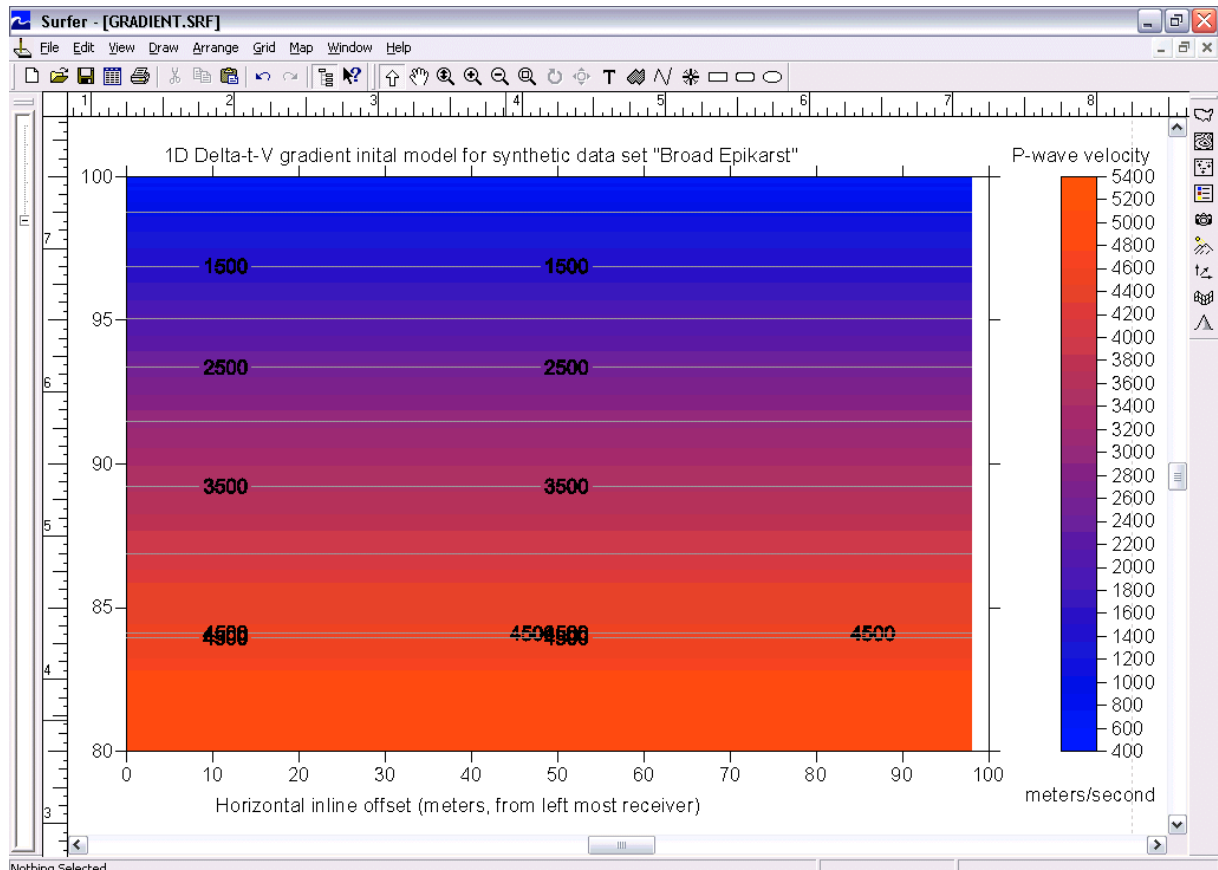
Pseudo 2D Delta-t-V initial model (default parameters) :



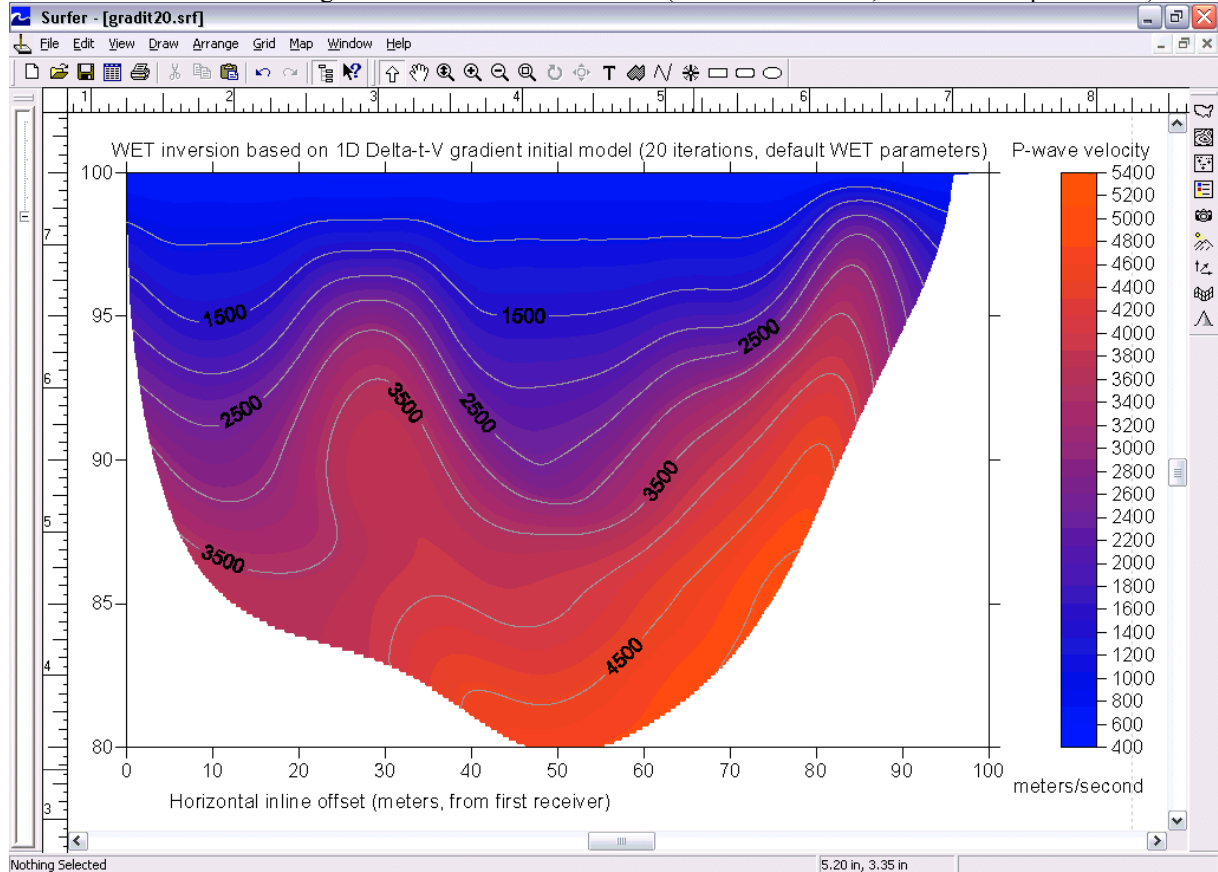
WET inversion based on pseudo 2D Delta-t-V initial model (20 WET iterations, default WET parameters) :



1D gradient Delta-t-V initial model, as obtained with new "Smooth inversion" method



WET inversion based on 1D gradient Delta-t-V initial model (20 WET iterations, default WET parameters) :



Now process the data set with **Smooth inversion|WET with gradient initial model**.

At the top of the previous page, we show the 1D gradient Delta-t-V initial model as obtained with our new “Smooth inversion” method. The 1D velocity vs. depth profile is determined automatically by averaging velocities of the pseudo 2D Delta-t-V initial model over all CMP stations, at common depths.

At the bottom of the previous page, we show WET output as obtained after 20 WET iterations, based on above 1D gradient Delta-t-V initial model. This WET processing is done automatically and part of our new “Smooth inversion”.

Note how the WET inversion based on the 1D gradient Delta-t-V initial model shows considerably less artefacts in the basement than the inversion based on the pseudo 2D Delta-t-V initial model.

Based on above documentation, we strongly recommend to always use our new “Smooth inversion” method to obtain a realistic interpretation. If there is no strong lateral velocity variation (as determined e.g. based on the “Smooth inversion” WET output), you then have the option to proceed with “Automatic Delta-t-V and WET inversion”.

You may then estimate the magnitude of pseudo 2D Delta-t-V artefacts by comparing the pseudo 2D Delta-t-V initial model with the “Smooth inversion” WET output. If below anticlines the pseudo 2D Delta-t-V velocity is significantly lower than the “Smooth inversion” velocity, you may want to prefer the “Smooth inversion” WET interpretation.

The main disadvantage of our new “Smooth inversion“ method is a decreased capability to recognize velocity inversions, in case of horizontal stratigraphy. Also, the vertical velocity resolution is somewhat decreased, for the special case of horizontal subsurface layering.

We would like to thank Jacob Sheehan for making available this crucial model and synthetic data set, and for motivating us to implement our new “Smooth inversion” in the first place.

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