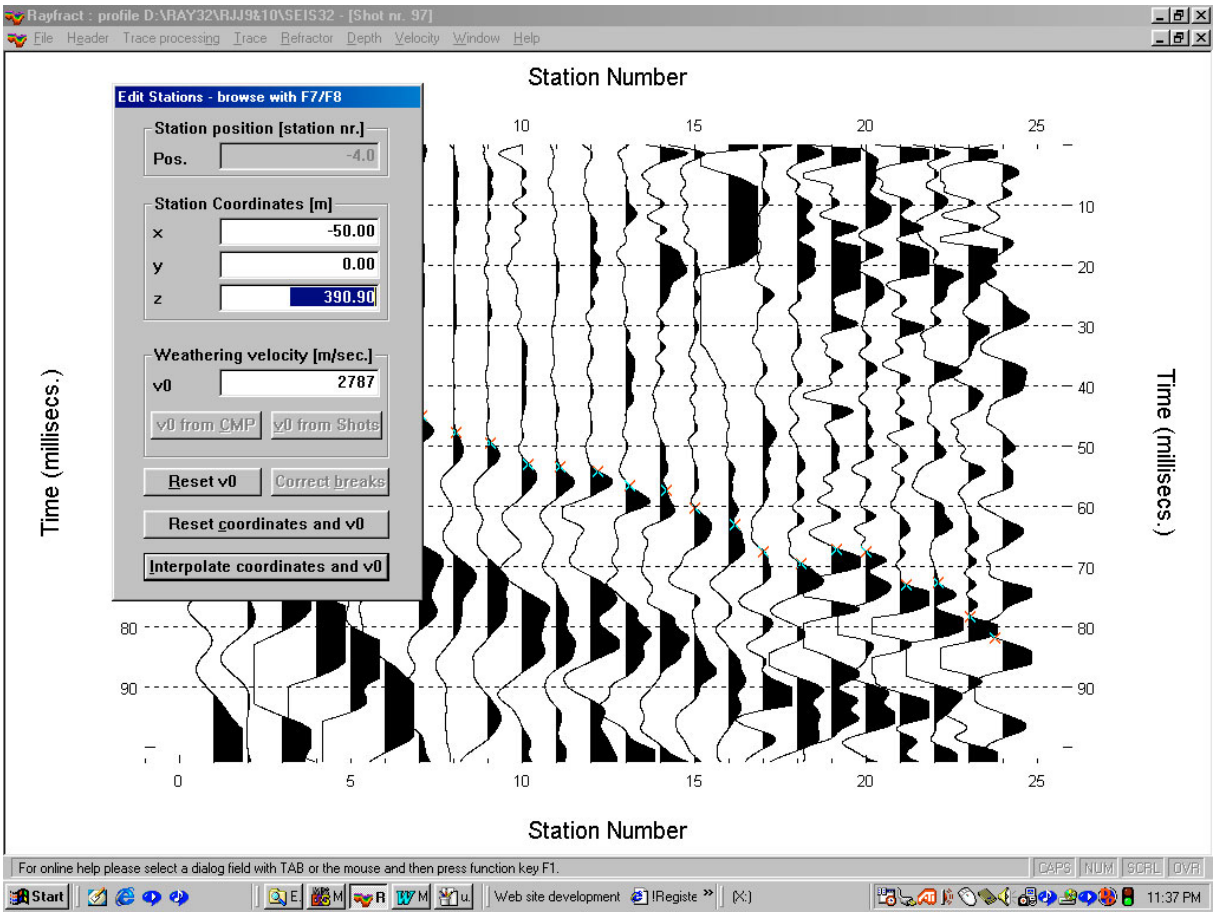
Tutorial for Delta-t-V processing of profile RJJ9TO10 :

This tutorial assumes that you have already imported successfully shots 97 to 107, into a newly created Rayfract profile. Reopen that profile with your Rayfract software (File|Open). Verify that the Receiver spacing (Header|Profile) is set to 10 meters.

Now open the Station & Shotpoint editor with Header|Station. Then correct the z (elevation) at station nr. –4 to a value of 390.9 meters, as shown here :



Now page forward once with F8. Confirm the prompt regarding change of the coordinates (for station nr. –4). Then enter a z value of 378.1 meters, for station nr. 0. Now page to the last profile station with ALT-END, and enter a z value of 401 meters, for station nr. 29. Then page one station backward with F7. Now enter a z value of 387.3, for station 24. Then close the Station Editor by hitting RETURN once or by clicking on button Interpolate Coordinates and v0.

Now make sure that Depth|Output Horizontal Offset of CMP pos. in meters is checked. If not so, select that menu item to check it. Now initiate the Delta-t-V inversion with Depth|CMP Velocity vs. Depth (Delta-t-V)... . Accept the default processing parameters by hitting RETURN. The routine will generate a file named DELTATV.CSV and another file named DELTATV.PAR.

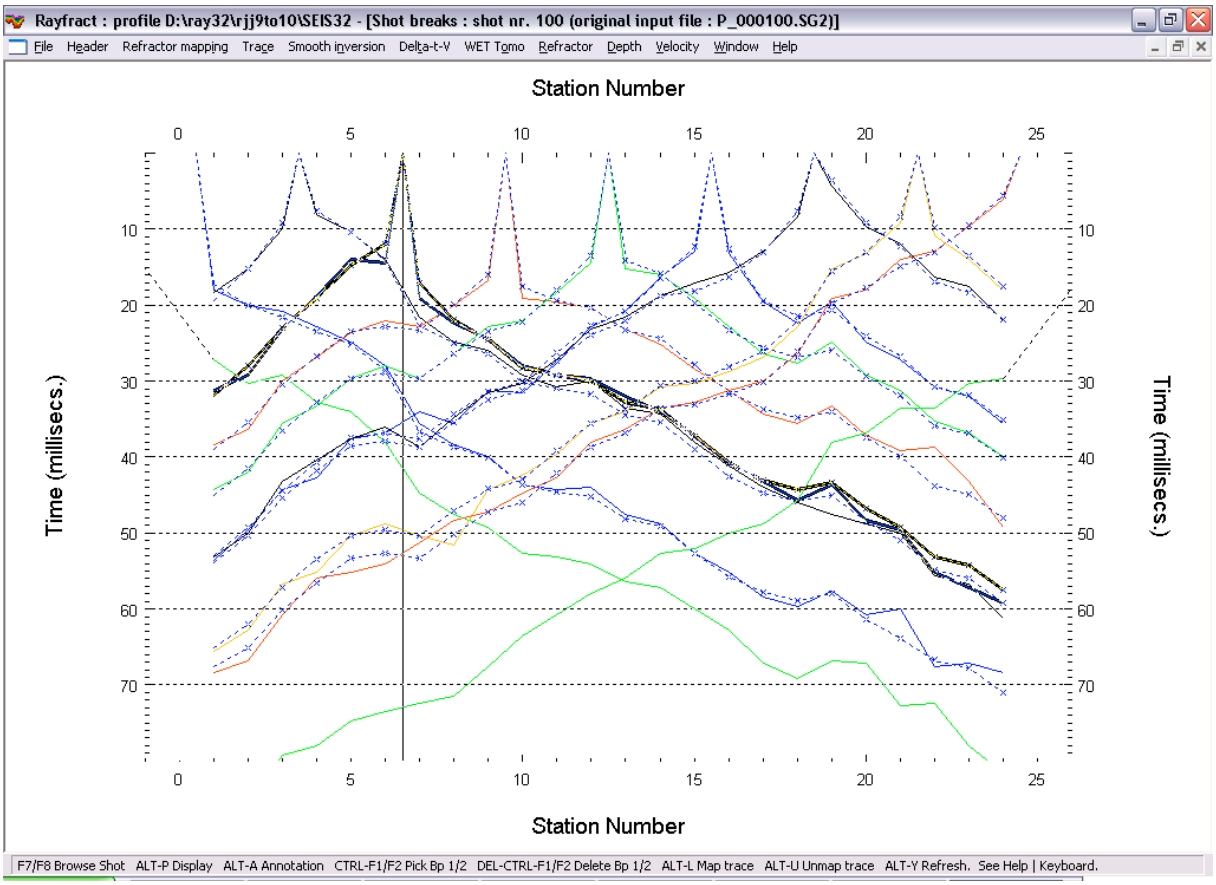
Now start up Surfer and select Grid|Data. Then select file \RAY32\RRJ9TO10\DELTATV.CSV. Change values for the two edit fields in column „# of Lines“ for rows „X Direction“ and „Y Direction“ to 800 and 205, respectively. Note the high resolution which makes sense in order to optimally image the very shallow and sharp contact zone between overburden and basement, as visible on the traveltime curves below. Now click on the OK button, of the „Scattered Data Interpolation“ dialog.

Once Surfer announces with three beeps that the gridding / kriging of the data (Delta-t-V output) has been done, select Grid|Blank... and then file \RAY32\RRJ9TO10\DELTATV.GRD. Then select file \RAY32\RRJ9TO10\SEIS32.BLN as Surfer Boundary File. This file specifies the line geometry in Surfer compatible format. Now specify \RAY32\RRJ9TO10\DELTATV.GRD as output file. Confirm the prompt to overwrite the existing DELTATV.GRD.

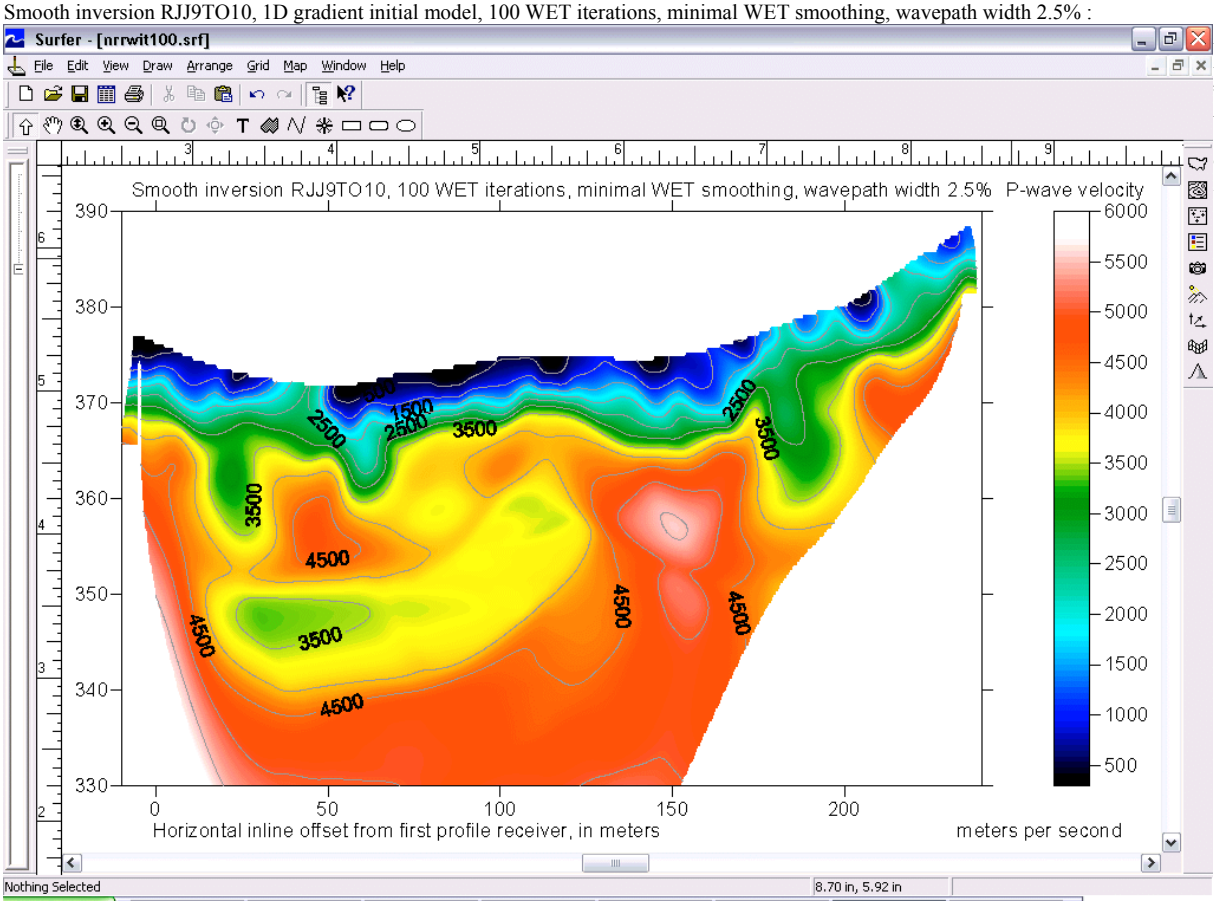
Refining Delta-t-V velocity model with tomography processing

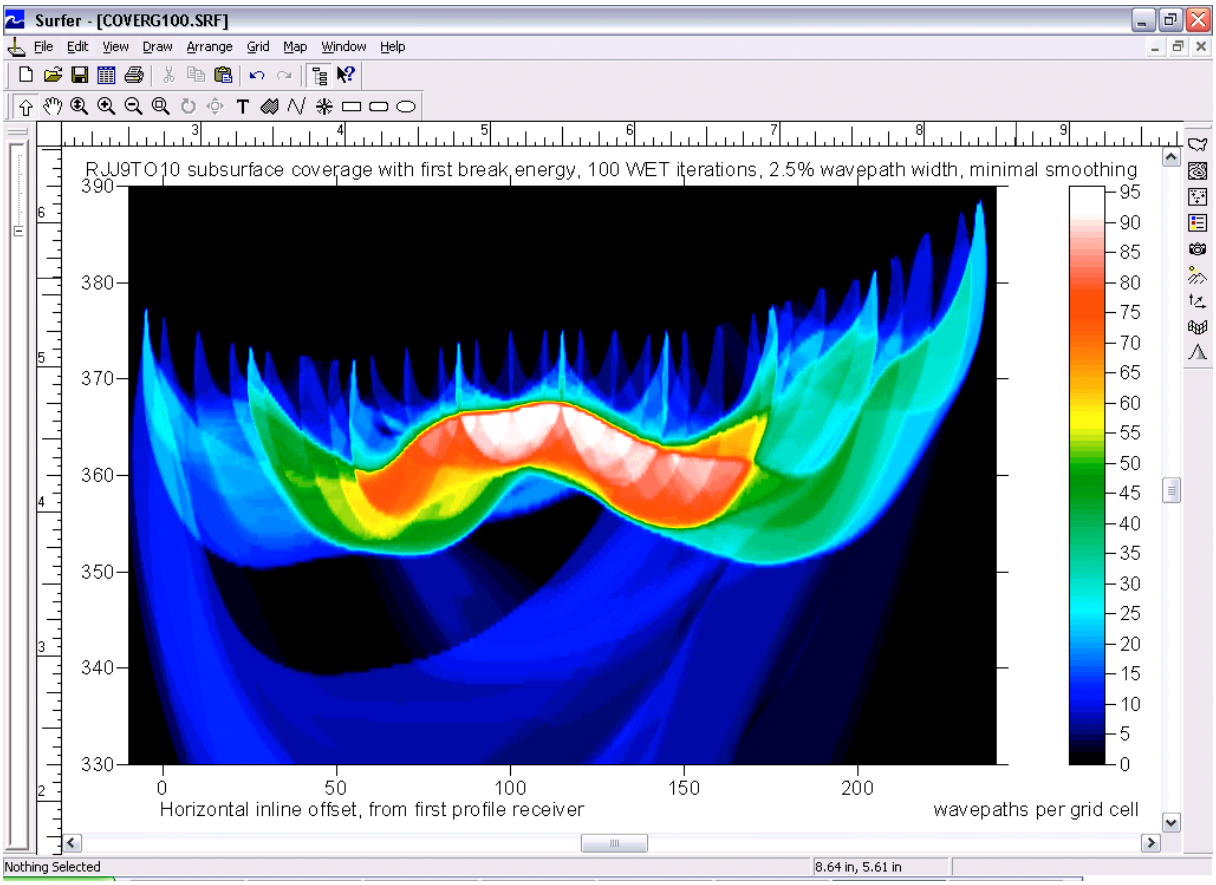
Now select Depth|Tomography processing of traveltimes ... . Then click on button „Select“ and specify the DELTATV.GRD file as generated above. Activate check box „Correct basement velocities for systematic Delta-t-V error“ in addition to „Correct all velocities for systematic Delta-t-V error“. Click on button „Accept parameters“. Now click on button „Edit velocity smoothing“ and then select radio button „Minimal smoothing after each tomography iteration“. Click on „Accept parameters. Click on button „Edit grid file generation“ and enable option „Write section coverage grids after each iteration“. Click on „Accept parameters“. Set parameter „Number of WET tomography iterations“ to 20. Now click on button „Start tomography processing“.

Once the tomography processing has terminated after 20 iterations and about 10 minutes of processing time (on Pentium III processor at 500 MHz), select Refractors|Shot breaks to display picked and synthesized traveltimes (blue crosses) together as shown below：



Smooth inversion RJJ9TO10, 1D gradient initial model, 100 WET iterations, minimal WET smoothing, wavepath width 2.5% :





Subsurface coverage with first break energy, 1D gradient initial model, 100 WET iterations, 2.5% wavepath width, minimal smoothing.

The SEG-2 formatted binary trace data files, ABEM .FIR first break files and the .COR coordinate file are available on our web site as archive

http://rayfract.com/tutorials/rjj9to10.zip .

Start by creating the profile (as described in e.g. line14.pdf, as available in TUTORIAL.ZIP on our web site), with a receiver spacing of 10 metres and profile database name / DOS subdirectory name RJJ9TO10. Then create a directory named \RAY32\RJJ9TO10\INPUT. Now copy rjj9to10.zip as downloaded via above link into that INPUT subdirectory and unzip it. Then import the .SG2 binary trace data files, with the default spread type of 24 receivers. The ABEM .FIR first break files will be imported automatically at the same time. Then import the coordinate file rjj9to10.cor, with File|Update Station Coordinates... . Now proceed as outlined in this tutorial, from the beginning.

For theoretical background of our new tomography algorithm, see

Wavepath eikonal traveltime inversion: Theory (Gerard T. Schuster and Aksel Quintus-Bosz 1993, GEOPHYSICS VOL. 58 NO. 9 September 1993, P. 1314 – 1323) .

For more information regarding our Rayfract™ software, please go to our web site

http://rayfract.com .