

SRT imaging of buried stream channel in estuary setting with 21 shots into 67 receivers :

- Fig. 1 : left : *Trace*|*Shot gather*, right : *Refractor*|*Shot breaks*. Shows fit between picked times (solid grey curves, red crosses) and modeled times (dashed blue curves, blue crosses) obtained by forward modeling over Fig. 2b. Compare with Fig. 15 showing fit for Fig. 12.
- File|New Profile ..., set File name to NORCAL14 and click Save button
- set *Station spacing* to 6.096m in *Header*|*Profile*...
- unzip NORCAL14.ZIP with Line1 travel times.VS and Line1.COR in C:\RAY32\NORCAL14\INPUT
- uncheck File|Import Data Settings|Default distance unit is meter to specify unit feet
- uncheck File Import Data Settings Default time unit is seconds to specify unit ms
- select File Import Data ... and set Import data type to Geometrics PlotRefa .VS
- leave Default spread type at 10: 360 channels
- click upper Select button, navigate into C:\RAY32\NORCAL14\INPUT and select the .VS file
- click Open button, Import shots button. The Import shot dialog is shown for each shot in the .VS file.
- for each shot leave Layout start and Shot pos. at shown values and click Read button
- File Update header data Update Station Coordinates with C:\RAY32\NORCAL14\INPUT\Line1.COR
- select Trace|Shot gather and Window|Tile to obtain Fig. 1.
- for both windows click title bar, press ALT+P, set Maximum time to 110 ms and hit ENTER key.
- uncheck Smooth invert|Smooth inversion Settings|Interpolate velocity for 1D-gradient initial model
- uncheck Smooth inversion Settings Wide smoothing filter for 1D initial velocity profile
- check Smooth inversion Settings Limit WET velocity to maximum velocity in initial model
- select Smooth invert|WET with 1D-gradient initial model and confirm for default interpretation
- select WET Tomo Interactive WET tomography...
- set Number of WET tomography iterations to 100 and click Start tomography processing for Fig. 2 & 3
- for *WET parameters* used see archive <u>NORCAL14\_332GRADTOMO.RAR</u> with starting model files GRADIENT.GRD & GRADIENT.PAR, VELOIT100.GRD & .PAR and .SRF Surfer 11 plots
- see Fig. 4 and Fig. 5 for WET parameters and WET settings used
- for help on our new *WET smoothing* and *Conjugate Gradient* parameters see updated <u>.pdf reference</u> chapter *WET Wavepath Eikonal Traveltime tomography*



Fig. 2a : 1D-gradient starting model, obtained by horizontally averaging DeltatV inversion output. Smooth inversion settings as in Fig. 5. Default DeltatV settings.

NORCAL Line 1, 100 WET iterations, RMS error 1.2 %, 1D-Gradient smooth initial model, Version 3.32



Fig. 2b : Tomogram with 1D-gradient starting model Fig. 2a, 100 Steepest Descent WET iterations, default settings. Wavepath width 5%, Gaussian smoothing. Smooth after every 2<sup>nd</sup> WET iteration. Smooth velocity update, smooth after last iteration. Smoothing sigma 1.0. Full smoothing filter : half filter width 18, half filter height 1. Maximum velocity update 25%. Don't adapt shape of rectangular filter. WET settings and blanking as in Fig. 5. Note the good correlation between CMP refractor from Fig. 10 (plotted as thick white line) and tomogram velocities.

The geology for this line consists of dry sand over saturated sand over terrace deposits in an estuary setting. The apparent cavity shown in Fig. 2b at horizontal offset 50m to 100m and elevation of -5m is probably a buried stream channel. According to <u>Bachrach and Nur 1998</u> Fig. 1 the P-wave velocity of dry sand is about 200 m/s. See our Fig. 10 for CMP refraction model obtained assuming an overburden velocity of 200 m/s. We use this as a starting model for WET inversion. See Fig. 11 and following Figs. and instructions on page 3 and 5 of this tutorial.

NORCAL Line 1, 1D-Gradient smooth initial model, RMS error 5.9 %, Version 3.32







ait wer wavepath tikonal fraveitime fomography Parameters		cuit wer romography velocity smoothing Parameters
Seject D:\RAY32\NORCAL14\GRADTOMO\GRADIENT.GRD		Determination of smoothing filter dimensions Full smoothing after each tomography iteration
Stop WET inversion after Number of WET tomography iterations : or RMS error gets below or RMS error does not improve for n = or WET inversion runs longer than WET regularization settings	100     iterations       2.0     percent       20     iterations       100     minutes	Minimal smoothing after each tomography iteration     Manual specification of smoothing filter, see below     Smoothing filter dimensions     Half smoothing filter width :     18 columns     Half smoothing filter height :     19 grid rows     Filter shallow dipping wavepath artefacts from model
Wavepath frequency :           Ricker differentiation [-1 is Gaussian bell] :           Wavepath width [percent of one period] :	50     Hz       -1     times       5.0     percent	Automatically adapt shape of rectangular filter matrix     Maximum relative velocity update after each iteration     Maximum velocity update : 25 percent
Wavepath envelope width [% of period] :       Maximum valid velocity [m/sec.] :       2:       Width of Gaussian for one period [sigma] :	0.0         percent           316         m/sec.           3.0         sigma	Smooth after each nth iteration only Smooth nth iteration : n = 2 iterations
Gradient search method Gradient search method Conjugate Gradient Conjugate Gradient Conjugate Gradient Parameters		Gaussian     C Uniform Used width of Gaussian     Smooth velocity update before updating tomogram
Initial step     0.10     Line Search tol.       Initial step     0.10     Line Search iters       Image: Steepest Descent step     CG iterations       Edit velocity smoothing     Edit grid file	. 3 15	Smooth velocity update and tomogram after update     Smooth last iteration     Accept parameters     Reset parameters
Start tomography processing Reset	Cancel	

Fig. 4 : WET parameter settings for Fig. 2 & 3. left : main interactive WET dialog. right : edit velocity smoothing

- select *Header* Station and click button Reset v0. Confirm prompt. Edit v0 to 200 m/s and hit ENTER key
- select *Refractor*|*Midpoint breaks* and press ALT+M. Uncheck *Direct wave first breaks recorded*.
- set Refractor Count to 1, Weathering limit to 1000 m/s, CMP Stack Width to 50. See Fig. 6.
- click button Map Traces. Press ALT+G & click Accept button to laterally smooth crossover distances.
- check *Grid*|*Plot refractors on tomogram*. Select *Depth*|*CMP Intercept-Time Refraction* and confirm to obtain Fig. 10. Continue as described on page 5 with *WET inversion* using Fig. 10 as starting model.



Fig. 5 : left : WET Tomo|WET tomography Settings . right : Smooth invert|Smooth inversion Settings for Fig. 2 & 3.



Fig. 6 : map traces to refractors in Refractor|Midpoint breaks with ALT+M





2500

2400

21

20

19

Fig. 7 : CMP intercept-time refraction starting model, obtained with Depth menu and mapping as in Fig. 6, weathering velocity edited to 700 m/s in Header|Station



NORCAL Line 1, 100 WET iterations, RMS error 1.4 %, Version 3.32

Fig. 8a : WET inversion 100 iterations, wavepath width 10%, Steepest Descent, minimal smoothing, adapt rectangular filter shape, uniform smoothing, starting model Fig. 7. Smooth after each 2<sup>nd</sup> WET iteration. Smooth velocity update, smooth after last iteration. See Fig. 9 for WET parameters used. WET settings and blanking as in Fig. 5. CMP refractor from Fig. 7 is plotted in red color. For .GRD & .PAR files and Surfer 11 plots see this archive.

- uncheck all WET blanking flags shown as checked Fig. 5 in WET Tomo WET tomography Settings •
- check WET Tomo|WET tomography Settings|Limit WET velocity to maximum velocity in initial model
- WET Tomo Automatic WET tomography with \RAY32\NORCAL14\LAYRTOMO\CMPMODL.GRD to obtain Fig. 11
- select WET Tomo Interactive WET tomography... and set Number of WET tomography iterations to 50
- set other WET parameters in main dialog and smoothing dialog as shown in Fig. 14
- click button Start tomography processing to obtain Fig. 12 and Fig. 13
- select *Refractor*|Shot breaks to display Fig. 15 showing fit between picked and modeled times





Edit WET Wavepath Eikonal Traveltime Tomography Parameters	Edit WET Tomography Velocity Smoothing Parameters
Specify initial velocity model Select D:\vay32\NORCAL14\LAYRTOMO\CMPMODL.GRD	Determination of smoothing filter dimensions C Full smoothing after each tomography iteration (Minimal smoothing after each tomography iteration
Stop WET inversion after	<ul> <li>Minimal smoothing after each tomography iteration</li> <li>Manual specification of smoothing filter, see below</li> </ul>
or RMS error gets below     2.0       or RMS error does not improve for n =     20       terations     100	Smoothing filter dimensions Half smoothing filter width : 7 columns Half smoothing filter height : 0 grid rows
WET regularization settings Wavepath frequency : 50 Hz	Filter shallow dipping wavepath artefacts from model
Ficker differentiation [-1 is Gaussian bell] :         -1         times           Wavepath width [percent of one period] :         10.0         percent	Maximum relative velocity update after each iteration Maximum velocity update : 35 percent
Wavepath envelope width [% of period]:     0.0     percent       Maximum valid velocity [m/sec.]:     2211     m/sec.	Smooth after each nth iteration only Smooth nth iteration : n = 2 iterations
Width of Gaussian for one period [sigma] : 3.0 sigma	- Smoothing filter weighting
Gradient search method	Used width of Gaussian 1.0 sigma
Conjugate Gradient Parameters           Tolerance         0.001           Line Search tol.         0.0010           Initial step         0.10           Line Search iters.         3           V         Steenest Descent sten         CG iterations	Smooth velocity update before updating tomogram           Smooth velocity update and tomogram after update           Smooth last iteration
Edit velocity smoothing     Edit grid file generation	Accept parameters Reset parameters
Start tomography processing Reset Cancel	

Fig. 9 : WET parameters to obtain Fig. 8 tomogram, with Fig. 7 as starting model. WET settings and blanking as in Fig. 5. To reset WET parameters for Fig. 8 unzip <u>this archive</u> in directory C:\RAY32\NORCAL14\LAYRTOMO and select *Grid*|*Reset DeltatV and WET settings to .PAR file...* & C:\RAY32\NORCAL14\LAYRTOMO\VELOIT100.GRD .





Fig. 10 : CMP intercept-time refraction starting model, obtained with Depth menu and mapping as in Fig. 6, weathering velocity edited to 200 m/s in Header|Station. Compare with Fig. 7 : weathering velocity fixed at 700 m/s.



NORCAL Line 1, 20 WET iterations, RMS error 1.7 %, Version 3.32

Fig. 11 : WET inversion 20 iterations, wavepath width 5%, Steepest Descent, full smoothing, don't adapt rectangular filter shape, Gaussian smoothing, starting model Fig. 10. Smooth after each 2<sup>nd</sup> WET iteration. Smooth velocity update, smooth after last iteration. Don't blank at tomogram bottom. See Fig. 14 for WET parameters used. WET settings as in Fig. 5 but no blanking below envelope. CMP refractor from Fig. 10 is plotted in white color.







NORCAL Line 1, 50 WET iterations, RMS error 1.6 %, Version 3.32



The low velocity in the cavity at offset 50m to 100m can be explained by high water content and possibly organic rich sediments. This would result in gas in the pores which reduces the P-wave velocity. The shape and elevation of this low-velocity anomaly is not well constrained by the data and varies between Fig. 2b, 8, 11 and 12. For .GRD files and VELOIT50.PAR file and starting model CMPMODL.GRD & .PAR for Fig. 10 to 13 see this archive.

Edit WET Wavepath Eikonal Traveltime Tomography Parameters	Edit WET Tomography Velocity Smoothing Parameters
Specify initial velocity model Select D:\RAY32\NORCAL14\LAYRTOMO\CMPMODL.GRD Stop WET inversion after	Determination of smoothing filter dimensions     Full smoothing after each tomography iteration     Minimal smoothing after each tomography iteration     Manual specification of smoothing filter, see below
Number of WET tomography iterations :         50         tterations           or RMS error gets below         2.0         percent           or RMS error does not improve for n =         20         iterations	Smoothing filter dimensions Half smoothing filter width : 18 columns Half smoothing filter height : 1 grid rows
WET regularization settings Wavepath frequency : 50 Hz Ricker differentiation [-1 is Gaussian bell] : -1 times	Filter shallow dipping wavepath artefacts from model     Automatically adapt shape of rectangular filter matrix     Maximum relative velocity update after each iteration
Wavepath width [percent of one period]:     5.0     percent       Wavepath envelope width [% of period]:     0.0     percent       Maximum valid velocity [m/sec.]:     2211     m/sec.	Maximum velocity update :         35         percent           Smooth after each nth iteration only
Width of Gaussian for one period [sigma]:       3.0       sigma         Gradient search method       Conjugate Gradient	- Smoothing filter weighting Gaussian Used width of Gaussian 1.0 sigma
Conjugate Gradient Parameters       Tolerance     0.001       Initial step     0.10       Line Search iters.     3       Image: Steepest Descent step     CG iterations	Smooth velocity update before updating tomogram
Edit velocity smoothing     Edit grid file generation       Start tomography processing     Reset	Accept parameters Reset parameters

Fig. 14 : WET parameters used to obtain Fig. 12 tomogram, with Fig. 10 as starting model.



7//F8 Browse Shot ALT+P Display ALT+A Annotation CTRL+FL/F2 Pick Bp 1/2 ALT+FL/F2 Delete Bp 1/2 ALT+L Map trace ALT+U Momap trace ALT+V Refresh. Use left/right arrow key to move pick bar. See Help | Keyboard.

Fig. 15 : fit between picked traveltimes (yellow : weathering layer, red : basement refractor) and modeled times (dashed blue curves with blue crosses), after 50 WET iterations and forward modeling over Fig. 12. Leftmost and rightmost shots have shifted fit because of high elevation at line start & end. When disregarding these two shots the RMS error shown as 1.6% in Fig. 12 should decrease. Compare with Fig. 1 showing fit for Fig. 2b.

The low-velocity layers (velocity < 1,500 m/s) at elevation -1m and -3m in Fig. 2b could be layers of organic rich sediments with gas. These thin low-velocity anomalies are not visible in Fig. 8 due to more vertical smoothing (*Automatically adapt shape of rectangular filter matrix* enabled) and the layered starting model (Fig. 7). Fig. 11 and Fig. 12 are also based on a layered starting model (Fig. 10) while Fig. 2b is based on a 1D-gradient starting model (Fig. 2a).

For intermediate vertical smoothing change WET parameters shown in Fig. 4 :

- select *WET Tomo Interactive WET tomography...* and click button *Edit velocity smoothing* (Fig. 4)
- check *Manual specification of smoothing filter* (Fig. 4)
- increase *Half smoothing filter height* from 1 to 2 grid rows (Fig. 4)
- leave Automatically adapt shape of rectangular filter matrix unchecked as per default since 3.31
- click buttons Accept parameters and Start tomography processing (Fig. 4) to redo WET inversion

Alternatively redo WET inversion after unchecking *WET Tomo*|*WET tomography Settings*|*Scale WET filter height* (Fig. 5).

For more reliable data interpretation use <u>overlapping receiver spreads</u> and a shorter receiver separation to better constrain the overburden velocity. Check first breaks for <u>reciprocity</u> errors in *Trace*|*Offset gather*.

Below we show reprocessing of this data with our version 4.01 software with WDVS enabled, done in Dec 2020. We forced the *grid cell size* to 0.25m in *Header*|*Profile*. We use default WDVS settings : 200Hz, *Angle increment* 7 degrees, *Regard nth node* = 3.

WDVS Wavelength-Dependent Velocity Smoothing is described in

Zelt, C. A. and J. Chen, Frequency-dependent traveltime tomography for near-surface seismic refraction data, Geophys. J. Int., 207, 72-88, 2016



Fig. 16 : Map traces to refractors in Refractor|Midpoint breaks with ALT+M. Uncheck Direct wave first breaks recorded and specify 1D velocity model. Click Map traces. Press ALT+G, set Basement filter to 50 and click Accept to smooth crossover distance. Weathering velocity was determined previously by manual branch point picking (Fig. 15) and copied to Header|Station with ALT+L.



Fig. 17 : Plus-Minus method starting model. Map traces to refractors as in Fig. 16. Select Depth|Plus-Minus and proceed as in Fig. 20.



NORCAL Line 1 RMS error 3.4%=1.45ms 50 WET itr. 50Hz Width 10.0% initial PLUSMODL.GRD v. 4.01

Fig. 18 : Smooth inversion with starting model Fig. 17 and WDVS enabled (Fig. 21). 50 Steepest-Descent WET iterations with full WET smoothing. Wavepath width set to 10 percent in WET Tomo|Interactive WET. All blanking flags unchecked in WET Tomo|WET tomography Settings|Blank submenu. See Fig. 20 for instructions.

NORCAL Line 1 RMS error 3.4%=1.45ms 50 WET itr. 50Hz Width 10.0% initial PLUSMODL.GRD v. 4.01



Fig. 19 : WET wavepath coverage plot obtained with Fig. 18. Unit is wavepaths per pixel.

As shown above enabling WDVS for Smooth inversion can help to better image low-velocity regions below higher-velocity lenses.

Here is the <u>.RAR archive with profile database files</u> for Fig. 17 to 19. Here is the <u>.RAR archive with Surfer 11 .GRD & .PAR & .SRF files</u> for Fig. 17 to 19.



Fig. 20 : select Depth|Plus-Minus. When prompted to continue with WET click No button. Press ALT+M and edit Surface consistency from default 100 percent to 0. Press ENTER key to redo Plus-Minus and obtain Fig. 17 starting model. When prompted to continue with WET click Yes button. Increase WET wavepath width to 10% in WET Tomo|Interactive WET. Increase number of WET iterations to 50. Click button Start tomography processing to obtain Smooth inversion in Fig. 18 and 19.

Edit WDVS (Zelt & Chen 2016)				
Edit parameters for wavelength-dependent velocity smoothing				
use WDVS for forward modeling of traveltimes				
WDVS frequency	200	[Hz]		
Angle increment	7	[Degree]		
Regard nth node	3	[node]		
Parameters for Cosine-Squared weighting function				
a : Cosine argument power	1.000	[power]		
b : Cosine-Squared power	1.000	[power]		
OK Cance	I Res	et		

Fig. 21 : Model|WDVS Smoothing. Uncheck Model|Fast WDVS Smoothing.

The anomalous velocity profile at station no. 43 in Fig. 18 is due to the receiver spreads not overlapping at that station. See Fig. 15 and Fig. 19. Use <u>overlapping receiver spreads</u> when recording your shots in the field.

Below we show interactive WET inversion (Fig. 26) with WDVS (Fig. 27) and with starting model Fig. 23. We forced the weathering velocity to 200 m/s in Header|Station and mapped traces in Refractor|Midpoint breaks (Fig. 22).

Note the impression of wavepaths (Fig. 25) onto the WET tomogram (Fig. 24). This is related to the too wide shot spacing and the too much minimized WET smoothing in combination with enabling WDVS. See Fig. 28 for a smoother interpretation : same WET inversion as Fig. 2b but with WDVS enabled (Fig. 27).



Fig. 22 : map traces to refractors in Refractor|Midpoint breaks. Press ALT+M and edit 1D velocity model. Click Map traces. Press ALT+G to smooth crossover distance. Set Basement filter to 50 stations and click Accept. Weathering velocity was forced to 200 m/s in Header|Station before opening Refractor|Midpoint breaks.









Fig. 24 : WET Tomo|Interative WET (Fig. 26) with Fig. 23 Plus-Minus starting model. Conjugate-Gradient WET inversion with minimized WET smoothing (Fig. 26). WDVS enabled (Fig. 27). Compare with Fig. 18 using full WET smoothing. Also compare with our earlier Fig. 2b obtained without WDVS.







dit WET Wavepath Eikonal Traveltime Tomography Parameters		Edit WET Tomography Velocity Smoothing Parameters
Specify initial velocity model		Determination of smoothing filter dimensions
Select D:\ray32\NORCAL14\LAYF	RTOMO\PLUSMODL.GRD	Full smoothing after each tomography iteration
Stop WET inversion after		Minimal smoothing after each tomography iteration
Number of WET tomography iterations : 2	0 iterations	<ul> <li>Manual specification of smoothing litter, see below</li> </ul>
or RMS error gets below 2	0 percent	Smoothing filter dimensions
v or RMS error does not improve for n = 5	0 iterations	Half smoothing filter width : 11 columns
or WET inversion runs longer than 10	0 minutes	Half smoothing filter height : 1 grid rows
MET requirementes actions		Suppress artefacts below steep topography
Wavepath frequency : 5	0 Hz Iterate	Adapt shape of filter. Uncheck for better resolution.
Ricker differentiation [-1:Gaussian,-2:Cosine] :	1 times	Maximum relative velocity update after each iteration
Wavepath width [percent of one period] : 17.	0 percent Iterate	Maximum velocity update : 15.00 percent
Wavepath envelope width [% of period] : 0.	0 percent	Smooth after each nth iteration only
Min. velocity : 10 Max. velocity : 282	5 <b>m/sec</b> .	Smooth nth iteration : n = 10 iterations
Width of Gaussian for one period [sigma] : 3.	0 sigma	Smoothing filter weighting
Gradient search method		C Gaussian 🔍 Uniform 🗌 No smoothing
Steepest Descent     Conjugate Gradient		Used width of Gaussian 1.0 sigma
Conjugate Gradient Parameters		Uniform central row weight 1.0 [1100]
CG iterations 10 Line Search iters.	2	Smooth velocity update before updating tomogram
Tolerance 0.001 Line Search tol.	0.0010	Smooth update 🔽 Smooth nth 🦳 Smooth last
Initial step 0.10 Steepest Descent step		Damping of tomogram with previous iteration tomogram
Edit velocity smoothing Edit grid file generation		Damping [01] 0.350 Damp before smoothing
Start tomography processing Reset	<u>C</u> ancel	Accept parameters Reset parameters



Edit WDVS (Zelt & Chen 2016)			
Edit parameters for wavelength-dependent velocity smoothing			
use WDVS for forward modeling of traveltimes			
WDVS frequency	300	[Hz]	
Angle increment	5	[Degree]	
Regard nth node	2	[node]	
Parameters for Cosine-Squared weighting function			
a : Cosine argument power	1.000	[power]	
b : Cosine-Squared power	1.000	[power]	
OK Cancel Reset			

Fig. 27 : Model|WDVS Smoothing. Model|Fast WDVS Smoothing

Uncheck

Here is the <u>.RAR archive with profile database files</u> for Fig. 23 to 25. Here is the <u>.RAR archive with Surfer 11 .GRD & .PAR & .SRF files</u> for Fig. 23 to 25.



NORCAL Line 1 RMS error 3.1%=1.30ms 40 WET itr. 50Hz Width 5.0% initial GRADIENT.GRD v. 3.32

Fig. 28 : Same WET inversion as Fig. 2b but with WDVS enabled (Fig. 27). Using 1D-Gradient Starting model Fig. 2a. 40 Steepest-Descent WET iterations with WET smoothing as in Fig. 4.



Fig. 29 : Same WET inversion as Fig. 28 but without WDVS. Same as Fig. 2b obtained with version 3.32 in 2014. Starting model Fig. 2a. 100 Steepest-Descent WET iterations with WET smoothing as in Fig. 4.



NORCAL Line 1 RMS error 3.1%=1.30ms 40 WET itr. 50Hz Width 5.0% initial GRADIENT.GRD v. 3.32

Here is the <u>.RAR archive with profile database files</u> for Fig. 28 and 30. Here is the <u>.RAR archive with Surfer 11 .GRD & .PAR & .SRF files</u> for Fig. 28 and 30.

Below we show Smooth inversion with Plus-Minus starting model using manual picking of branch points.



Fig. 31 : Map traces to refractors in Refractor|Shot breaks with ALT+L (Fig. 15). Select Depth|Plus-Minus and confirm prompts to obtain this starting model and Smooth inversion tomogram (Fig. 32).



Fig. 32 : Smooth inversion with starting model Fig. 31. 20 Steepest-Descent WET iterations. WDVS as in Fig. 21.



NORCAL Line 1 RMS error 3.6%=1.52ms 20 WET itr. 50Hz Width 5.0% initial PLUSMODL.GRD v. 4.01

Here is the <u>.RAR archive with profile database files</u> for Fig. 31 to 33. Here is the <u>.RAR archive with Surfer 11 .GRD & .PAR & .SRF files</u> for Fig. 31 to 33.

We repicked the branch points separating the direct wave from the refracted wave in Fig. 15 and rerun our Smooth inversion with Plus-Minus starting model with 20 and 50 Steepest-Descent WET iterations with WDVS enabled. We forced the *grid cell size* to 0.25m in *Header*|*Profile*. See below.







Fig. 35 : Smooth inversion with default 20 Steepest-Descent WET iterations and full WET smoothing. WDVS enabled (Fig. 21). Starting model is Fig. 34.





Fig. 36 : Smooth inversion with 50 Steepest-Descent WET iterations and full WET smoothing. WDVS enabled (Fig. 21). Starting model is Fig. 34. Select WET Tomo|Interactive WET and increase Number of WET iterations from default 20 to 50. Click button Start tomography processing to obtain this figure and Fig. 37.





Here is the <u>.RAR archive with profile database files</u> for Fig. 34 to 36. Here is the <u>.RAR archive with Surfer 11 .GRD & .PAR & .SRF files</u> for Fig. 34 to 36.

Fig. 36 shows a better match with Fig. 28 and a smaller RMS error than Fig. 35. This shows that enabling WDVS can improve the vertical resolution when increasing the WET iteration count even with our Smooth inversion using full WET smoothing.

Check option WET Tomo|WET tomography Settings|Limit WET velocity to maximum velocity in initial model to counter a bias towards too high velocities in basement when enabling WDVS. This bias gets stronger when you decrease the WDVS frequency or the two other WDVS parameters : Angle increment and Regard nth node.

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