

TRA9002 Multiscale Steepest-Descent WET inversion Apr 2026 / scaled WDVS frequency 100Hz-200Hz / grid cell size forced to 2.0m in Rayfract® 5.03 Standard :

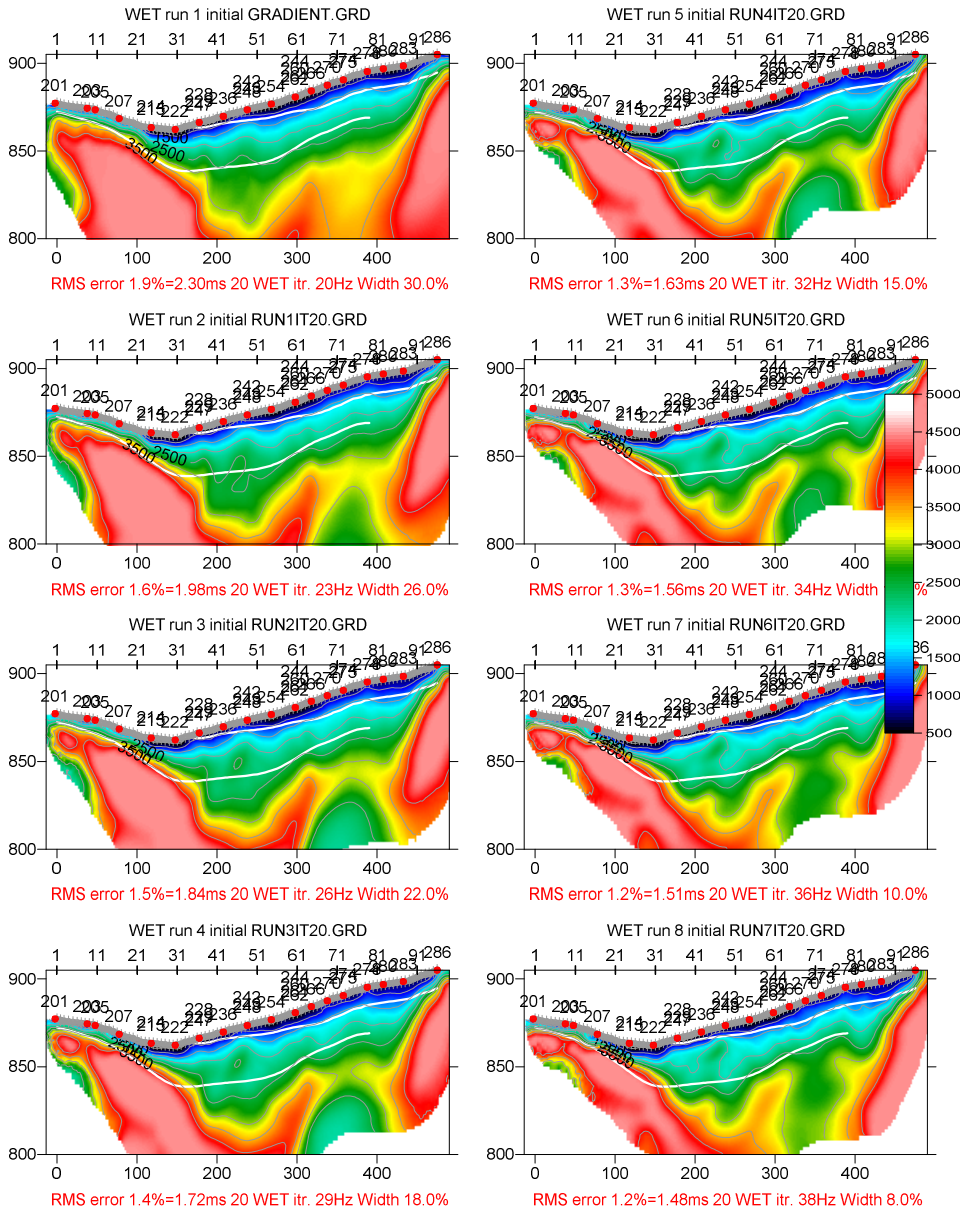


Fig. 1 : plot first 8 Steepest-Descent WET runs (20 WET iterations per run) for profile TRA9002 multiscale WET on one page with new Grid menu command **Plot multiple WET runs on one page** available with our 5.03 Standard version. Starting model for first WET run is our 1D-gradient grid file obtained with **Smooth invert|WET with 1D-gradient initial model** (Fig. 12). See Fig. 4 to Fig. 7 for WET and WDVS settings used. See Fig. 10 for *Grid|Surfer plot limits* used. See Fig. 11 for *Header|Profile* settings used.

As shown in Fig. 1 and in Fig. 2 our new Grid menu command **Plot multiple WET runs on one page** available with our 5.03 Standard version allows visualizing multiple runs in one Surfer plot. This multiscale plot enables easy comparison of multiple WET runs (here 20 Steepest-Descent WET iterations per run) and allows to visually determine how well the multiscale WET inversion is working with your current WET and WDVS settings. Observe the decreasing RMS error shown in red in each plot's caption, with increasing run number as shown in each plot's title. See also our 2025 expanded abstract at https://rayfract.com/pub/geoconvention2025_abstract.pdf and <https://rayfract.com/tutorials/tra9002.pdf> and https://rayfract.com/tutorials/TRA9002_resolution_test.pdf and <https://rayfract.com/SAGEEP10.pdf>.

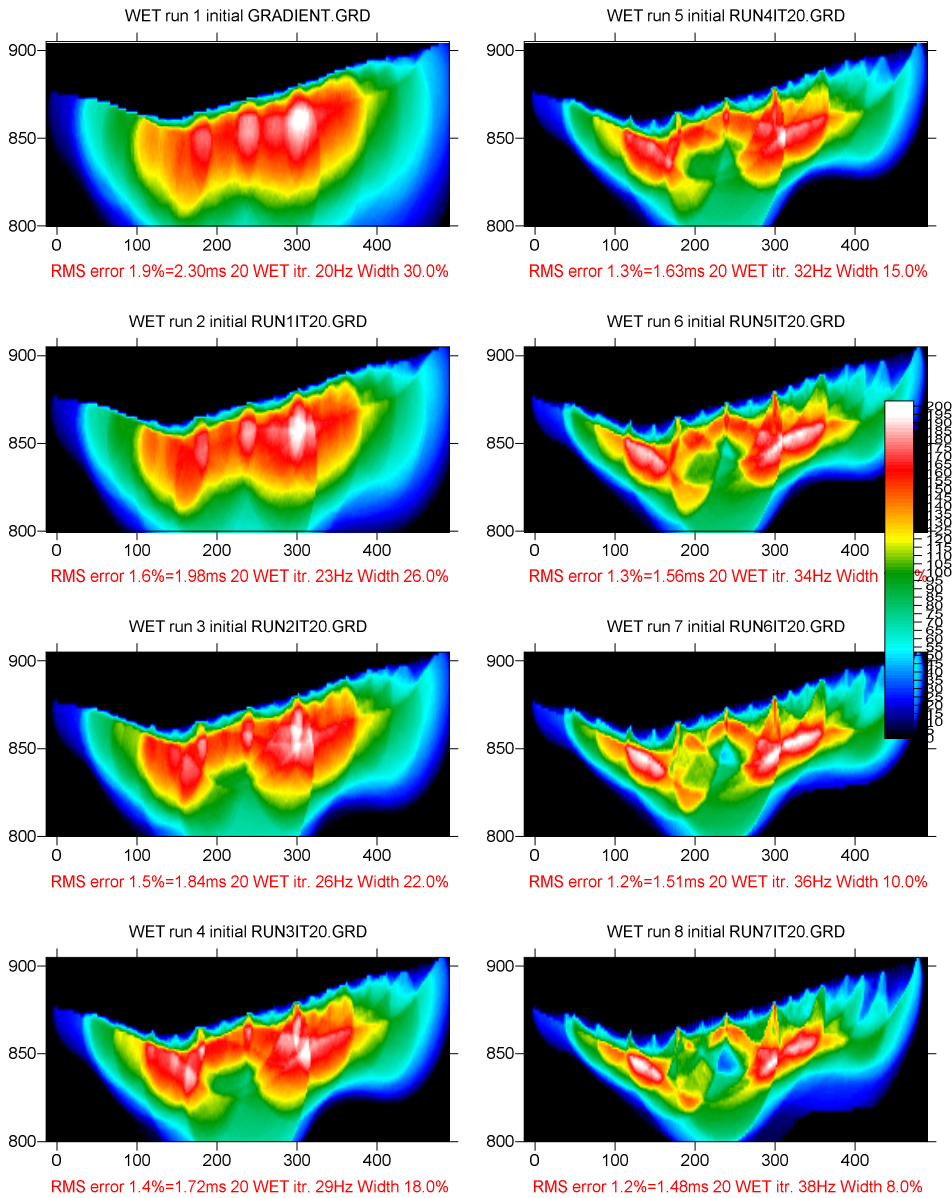


Fig. 2 : WET wavepath coverage plots obtained with Fig. 1. Unit is wavepaths per grid cell.

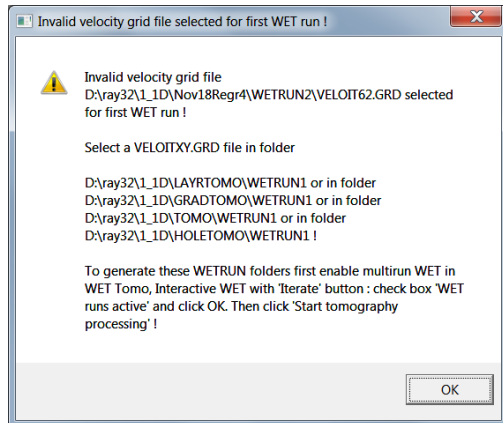


Fig. 3 : error prompt when you select a VELOITXY.GRD file not located in ..WETRUN1 folder with our *GridPlot multiple WET runs on one page* command available with our 5.03 Standard version.

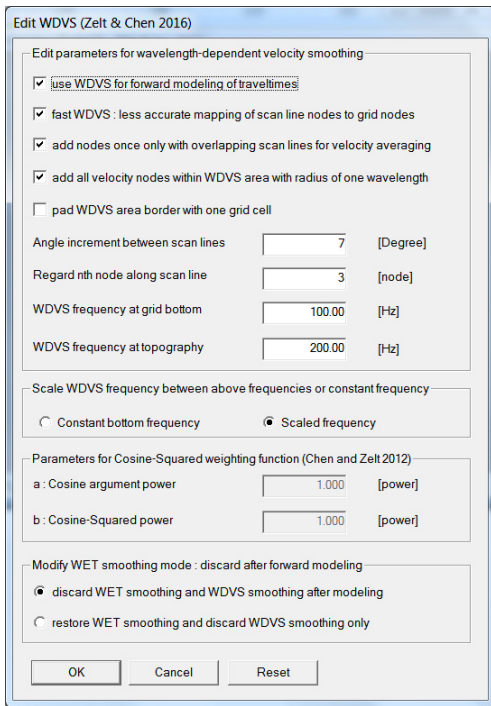


Fig. 4 : **Model/WDVS Smoothing** dialog with settings used to obtain Fig. 1. Edit as shown. Note the new 5.03 option **Scaled frequency**.

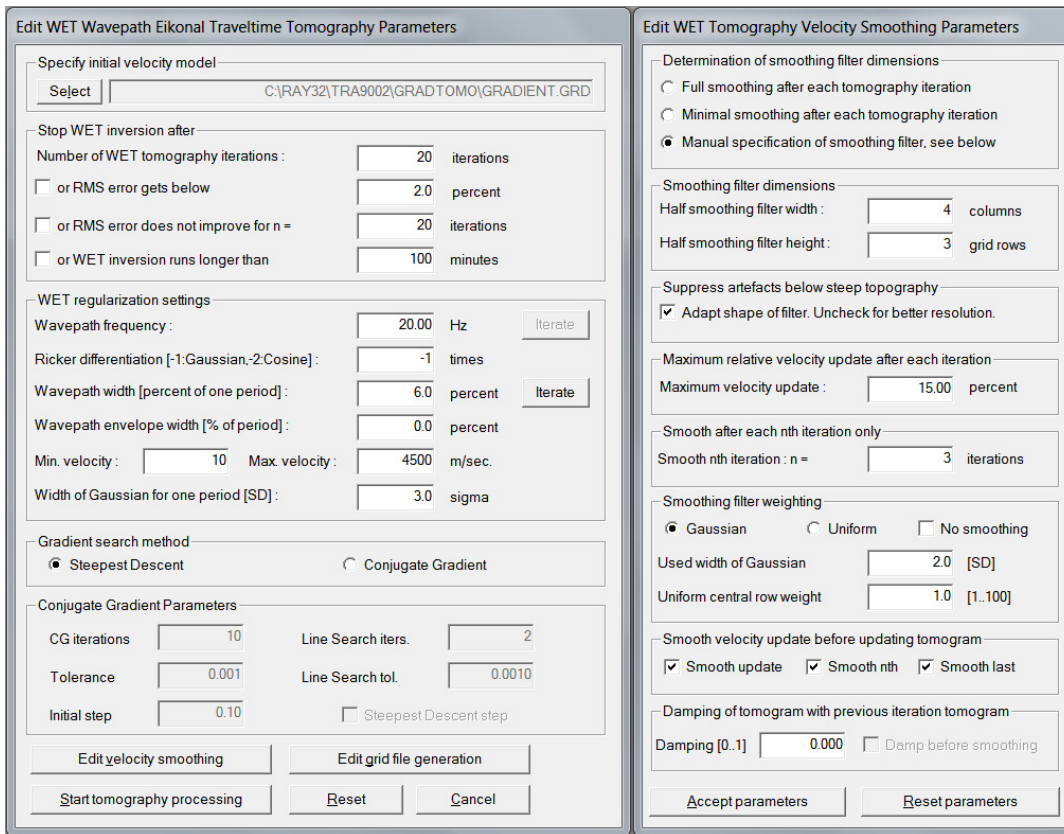


Fig. 5 : **WET Tomo/Interactive WET Tomo** main dialog (left). Click button *Edit velocity smoothing* (right). Edit as shown. Click button *Accept parameters*. Click button *Iterate* and edit as in Fig. 6. Click button **Start tomography processing** to obtain WET runs shown in Fig. 1 and Fig. 2.

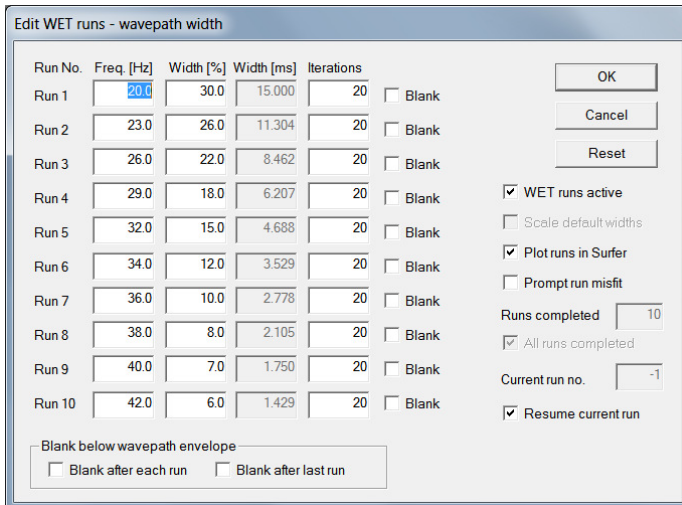


Fig. 6 : in *WET Tomo/Interactive WET* dialog (Fig. 5) click *Iterate* button to show this **multirun WET schedule** dialog. Edit as shown. Click button *OK*. In Fig. 5 click button *Start tomography processing* to obtain WET runs shown in Fig. 1.

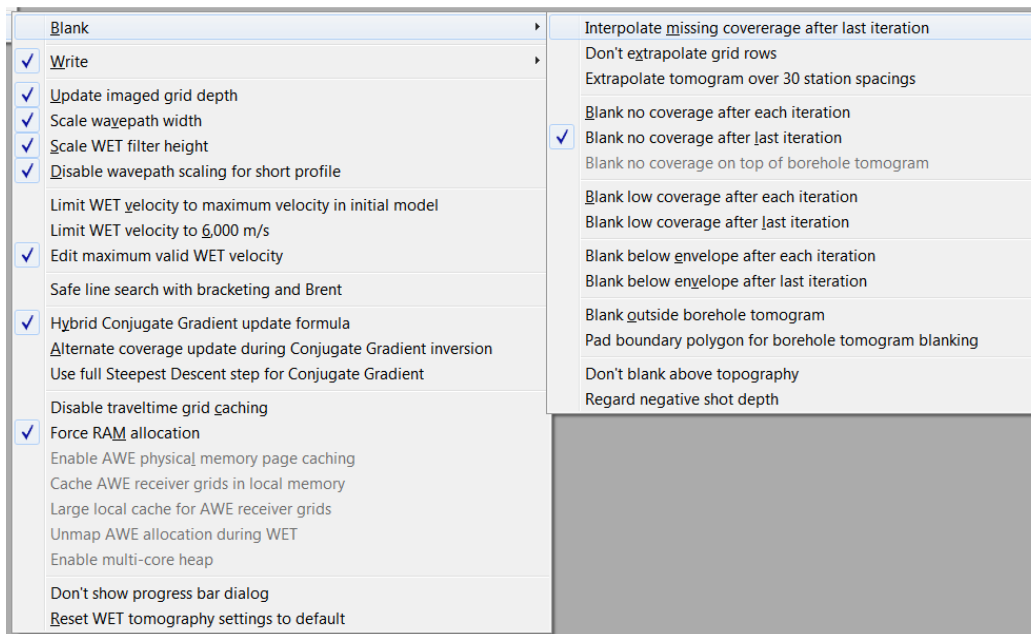


Fig. 7 : **WET Tomo/WET tomography Settings** used to obtain Fig. 1 and Fig. 2

Unzip the .RAR archive with TRA9002 profile folder / database files for Fig. 1 in root folder C:\Ray32 :

https://www.dropbox.com/scl/fi/kfuns75w8jzb2tnr3etag/TRA9002_seis32_ScaledWDVS_Apr9_2026.rar?rlkey=cc7cs83diz96b3k0h3fwmnwe1&st=3vy9c3ob&dl=0

Here is the .RAR archive for C:\Ray32\TRA9002\GRADTOMO subdirectory containing WET runs shown in Fig. 1 :

https://www.dropbox.com/scl/fi/xkxrd6oam5xjpx1ehreb7/TRA9002_GRADTOMO_ScaledWDVS_Apr9_2026.rar?rlkey=vz0sxpvyayq3ifg8g1j2hsf3mx&st=plnzclgn&dl=0

To obtain our default **Smooth inversion** output shown in Fig. 8 and Fig. 9 select **Smooth invert WET with 1D-gradient initial model** .

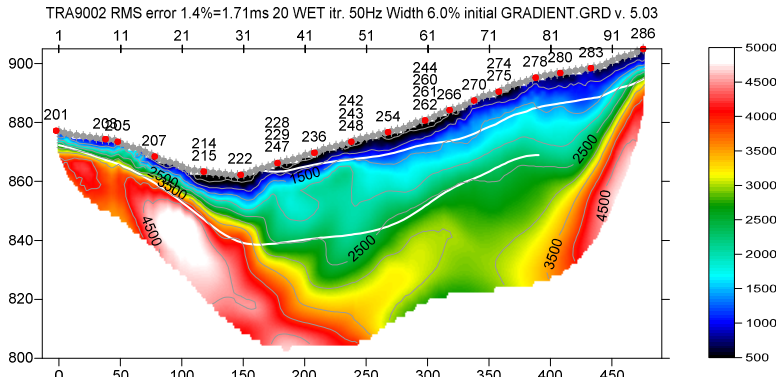


Fig. 8 : **Smooth invert/WET with 1D-gradient initial model** with WDVS and WET settings shown in Fig. 4 and Fig. 7. *Interactive WET Tomo* (Fig. 5) and *multiscale WET* (Fig. 6) parameters are not regarded for our Smooth inversion. See Fig. 10 for *Grid/Surfer plot limits* used. See Fig. 11 for *Header/Profile* settings used. The 1D-gradient initial model obtained and used with **Smooth invert/WET with 1D-gradient initial model** is shown in Fig. 12.

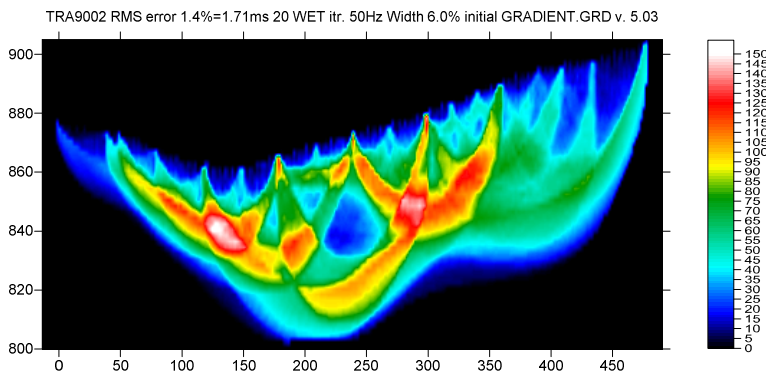


Fig. 9 : WET wavepath coverage obtained with Fig. 8. Unit is wavepaths per grid cell.

Fig. 10 : **Grid/Surfer plot Limits** used for Fig. 1 and Fig. 8. Edit as shown.

Edit Profile

Line ID: Time of Acquisition: Date: Time:

Line type: Instrument:

Job ID: Client:

Company: Time of Processing: Date: Time:

Observer: Units:

Note: Sort:

Const:

Station spacing [m]: Left handed coordinates

Min. horizontal separation [%]:

Profile start offset [m]:

Force grid cell size Cell size [m]:

Force first receiver station number for profile
 First receiver [station number]: Force first receiver

Extrapolate starting models and WET tomograms
 Extrapolate [station spacings]: Extrapolate tomograms

Add borehole lines for WET tomography
 Borehole 1 line:

Borehole 2 line:

Borehole 3 line:

Borehole 4 line:

Fig. 11 : **Header/Profile** dialog. Edit as shown to force the grid cell size to 2.0m. Then select *Smooth invert|WET with 1D-gradient initial model* to obtain Fig. 8 and Fig. 9.

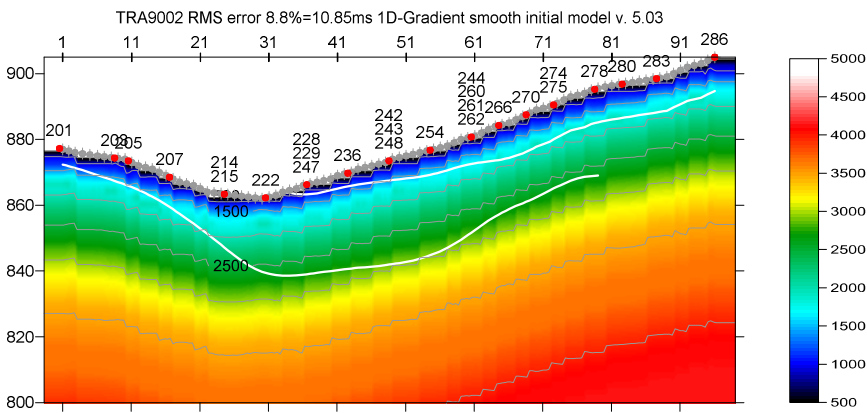


Fig. 12 : 1D-gradient starting model obtained by laterally averaging the pseudo-2D DeltatV inversion results (Sheehan 2005 and Rohdewald 2026). Select *Smooth invert|WET with 1D-gradient initial model* to obtain this starting model. When prompted to continue with WET inversion click **Yes** button to obtain Fig. 8 and Fig. 9.

References

Canadian Intellectual Property Office - Government of Canada 2025. Canadian Trademark Details: RAYFRACT — 1176887 <https://ised-isde.canada.ca/cipo/trademark-search/1176887?lang=eng>

Eidgenössisches Institut für Geistiges Eigentum 2025. Swiss Trademark Details: Titel RAYFRACT .
Markennummer 443830
<https://www.swissreg.ch/database-client/register/detail/trademark/1200041215>

Doll W. et al. 2010. Short Course Notes : Processing of Seismic Refraction Tomography Data. SAGEEP 2010 meeting in Keystone Colorado. <https://rayfract.com/SAGEEP10.pdf> .

Hiltunen, D. R., Hudyma, N., Quigley, T. P., & Samakur, C. 2007. Ground Proving Three Seismic Refraction Tomography Programs. Transportation Research Record, 2016(1), 110–120.
<https://doi.org/10.3141/2016-12>
<https://www.researchgate.net/publication/242072938> .

Rohdewald, S.R.C. 2026. Rayfract® manual. <https://rayfract.com/help/rayfract.pdf>

Rohdewald, S.R.C. 2021a. Improving the resolution of Fresnel volume tomography with wavelength-dependent velocity smoothing, Symposium on the Application of Geophysics to Engineering and Environmental Problems Proceedings : 305-308. <https://doi.org/10.4133/sageep.33-169> . Slides at <https://rayfract.com/pub/SAGEEP%202021%20slides.pdf>

Rohdewald, S.R.C. 2021b. Improved interpretation of SAGEEP 2011 blind refraction data using Frequency-Dependent Traveltime Tomography, EGU General Assembly 2021, online, 19–30 Apr 2021, EGU21-4214, <https://doi.org/10.5194/egusphere-egu21-4214>

Rohdewald, S.R.C. 2014. Optimized Interpretation of SAGEEP 2011 Blind Refraction Data With Fresnel Volume Tomography and Plus-Minus Refraction. Symposium on the Application of Geophysics to Engineering and Environmental Problems 2014, Paper No: SAGEEP.27-130, pp. 374-382, Boston March 2014. <https://doi.org/10.4133/SAGEEP.27-130> .
<https://www.researchgate.net/publication/269196999> .

Schuster, Gerard T. and Quintus-Bosz, Aksel 1993. Wavepath eikonal traveltimes inversion : Theory. Geophysics, volume 58, pp. 1314-1323. <https://dx.doi.org/10.1190/1.1443514>

Sheehan J.R., Doll W.E. and Mandell W.A. 2005. An Evaluation of Methods and Available Software for Seismic Refraction Tomography. Journal of Environmental and Engineering Geophysics, volume 10, pp. 21-34. ISSN 1083-1363, Environmental and Engineering Geophysical Society. JEEG March 2005 issue. <https://dx.doi.org/10.2113/JEEG10.1.21> . https://rayfract.com/srt_evaluation.pdf
<https://www.researchgate.net/publication/242159023>

Watanabe Toshiki et al. 1999. Seismic traveltimes tomography using Fresnel volume approach. SEG Houston 1999 Meeting, Expanded Abstracts. <https://www.researchgate.net/publication/240735641> .
<https://dx.doi.org/10.1190/1.1820777>

Zelt, C. A. and J. Chen 2016. Frequency-dependent traveltimes tomography for near-surface seismic refraction data, Geophys. J. Int., 207, 72-88, 2016. See <https://dx.doi.org/10.1093/gji/ggw269> and <https://www.researchgate.net/publication/305487180> .

Zelt, C.A., Haines, S., Powers, M.H. et al. 2013. Blind Test of Methods for Obtaining 2-D Near-Surface Seismic Velocity Models from First-Arrival Traveltimes, JEEG, Volume 18(3), 183-194.
<https://www.researchgate.net/publication/267026965>