# Rayfract® Seismic Refraction/Borehole Tomography software      Intelligent Resources Inc.
## Subsurface velocity structure imaging for geotechnical engineering and exploration

Rayfract® software allows reliable imaging of subsurface velocity with modeling of propagation of seismic first break energy. Import the seismic data and update the 2D profile geometry. Pick or import first breaks. Run our Smooth inversion method to objectively image velocity structure even with strong topography and strong lateral velocity variation. No assignment of traces to refractors required. Flexible smoothing options.

Get laterally averaged 1D-gradient starting models from the travel time data with DeltatV (improved Wiechert-Herglotz) & XTV methods. These methods give a good initial fit between modeled and picked times even with local velocity inversions.

Refine the starting model with WET Wavepath Eikonal Traveltime inversion aka Fresnel Volume Tomography. While conventional ray tracing models just one ray per first break WET models multiple signal propagation paths contributing to the same first break. Our Eikonal solver explicitly models diffraction besides refraction and transmission of seismic waves.

Rayfract® supports any 2D recording geometry including roll-along seismic reflection lines. Joint inversion of surface-refraction and borehole-recorded shots. Crosshole and multi-offset VSP surveys. Shallow marine refraction interpretation.

Use our layer-based Plus-Minus, Wavefront and CMP intercept-time refraction methods with layered subsurface geology. Map traces to refractors automatically or interactively. Refine layered starting model with 2D WET inversion.

- Requires Golden Software Surfer® version 9 to 27
- Microsoft Windows® 7/8/10/11, both 32-bit and 64-bit
- 360 traces per shot, 1000 shots per profile database
- 999 traces per shot for Pro license
- Import irregularly spaced receivers/streamer recorded data
- Flexible .HDR batch import of shots
- SEG-2 import GEOMETRICS, ABEM, DMT, OYO, SEISMIC SOURCE, SEISTRONIX, PASI, M.A.E., SARA DOREMI etc.
- SEGY import PROMAX, SEISMIC UNIX, SPW etc.
- Import ASCII, Interpex GREMIX, OYO SEISREFA, Rimrock PIK, EarthFX VIEWSEIS, W_GeoSoft WINSISM, OPTIM LLC SEISOPT, Geometrics SEISIMAGER, GeoTomCG, Geogiga DWTomo files with first break times and geometry
- Use overlapping receiver spreads to simulate one long spread. Use line-internal offset shots for depth penetration
- Build your own model with Surfer®. Synthesize traveltime data by forward modeling propagation with Rayfract®
- Interpret P-wave and S-wave data for same line and map dynamic Poisson's ratio with Surfer® Grid Math
- Downhole VSP, Walkaway VSP & crosshole surveys
- Min. / max. sample rate 1 microsecond / 1 second
- Import max. 20,000 samples per trace
- Handle Surfer® grid files with up to 640,000 nodes, up to 100,000,000 nodes with Pro license
- Flexible trace display, shot stacking and frequency filtering
- Automatic & interactive first break picking
- Semi-automatic & interactive mapping of traces to refractors
- Import/export picks & geometry & shot refractors & reciprocal picking errors from/to ASCII column files
- Uses multiple CPU cores : 4 for Standard, 32 for Pro license
- Pro license for long lines recorded with streamer. Pro uses up to 1 TB RAM. Standard license uses up to 4 GB RAM.
- Robust multi-scale tomography. WET velocity constraints.
- Wavelength-Dependent Velocity Smoothing (Zelt 2016)
- Plot reciprocal picks on Shot traces for easier quality control
- Trigger jitter removal for constant-velocity overburden
- Pro license allows Checkerboard test grid generation
- Add one borehole line to main refraction or borehole line for joint inversion. Add up to 4 borehole lines with Pro license.
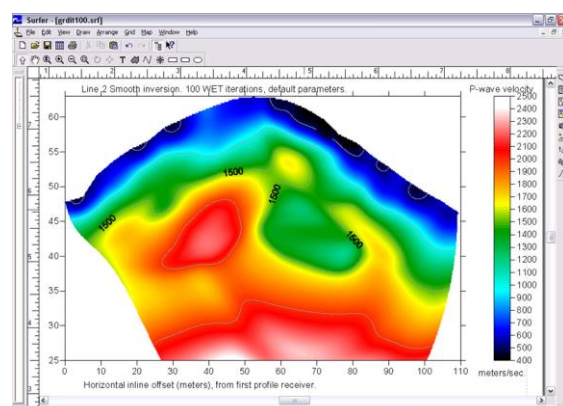
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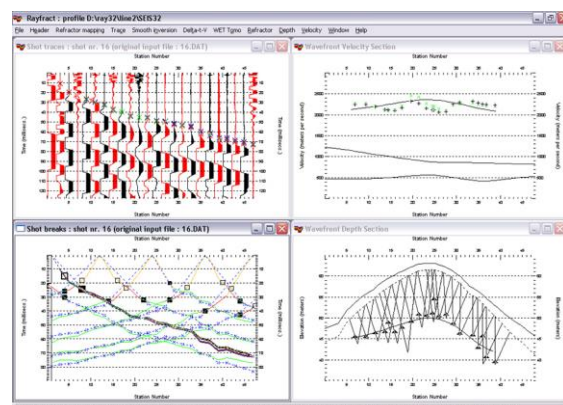**304 – 975 Chilco Street**
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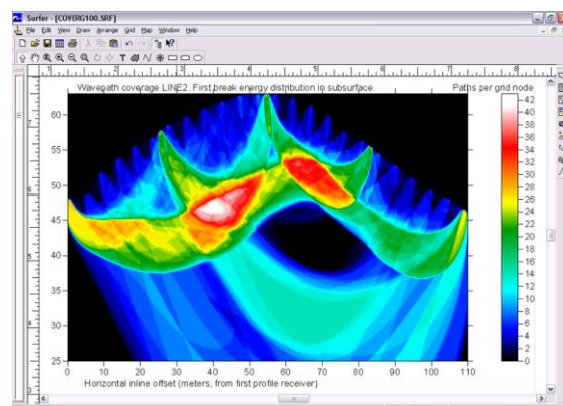**igs@idrogeostudi.com      www.idrogeostudi.com**
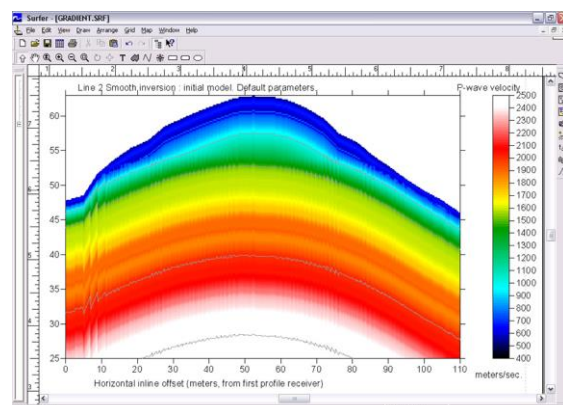
1D-gradient starting model : horizontally averaged DeltatV


Final WET inversion output, after 100 WET iterations


Conventional Wavefront interpretation. Note diving waves.


WET subsurface coverage with first break energy