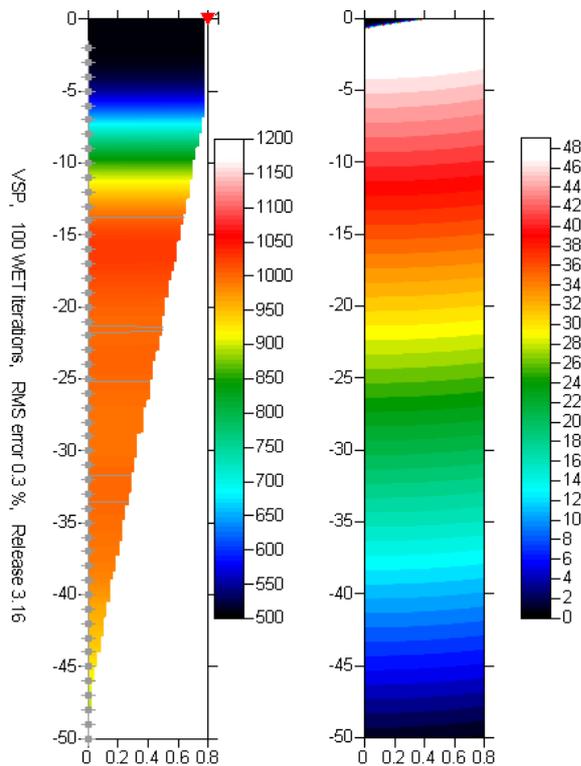Smooth inversion of zero-offset VSP downhole survey, with constant-velocity initial model :

Fig. 1 : borehole receiver spacing 1m, one shot point at 0.8m offset from borehole top, 100 WET iterations with default WET parameters and settings. Left : velocity tomogram in m/s . Right : first break energy and wavepath coverage, in paths/grid cell .

To invert the data with version 3.34 of our software, please proceed as follows :

- create a new profile database named VSP with a *Station spacing* of 1m. See our manual at http://rayfract.com/help/manual.pdf , chapter 1.1 . Specify *Line type* Borehole spread/line .
- download the sample VSP survey file from http://rayfract.com/samples/vsp.zip
- copy VSP.ZIP into \RAY32\VSP\INPUT, unzip to obtain VSP.3DD file
- import the first breaks and geometry data as described in our manual, chapter 1.2. Specify *Import data type* Tweeton GeoTomCG .3DD . Leave *Default spread type* at 10: 360 channels. Leave all other import parameters at their default settings.
- click on *Import shots* and then *Read* to import the VSP shot record. Leave all parameters at shown values.
- review traveltimes with *Refractor|Shot breaks* as usual. See our manual, chapter 1.3.
- reopen profile via *File menu* : select database C:\RAY32\VSP\SEIS32.DBD at bottom of menu
- uncheck option *WET Tomo|WET tomography Settings|Blank|Blank below envelope after last iteration*

- uncheck option *WET Tomo|WET tomography Settings|Blank|Blank outside borehole tomogram*
- select *Smooth invert|WET with constant velocity initial borehole model* to invert the data. Confirm prompts.
- select *WET Tomo|Interactive WET tomography...* and set *Number of WET tomography iterations* to 100
- click button *Edit velocity smoothing* and click radio button *Minimal smoothing*
- click button *Accept parameters*
- click button *Start tomography processing* and confirm prompts
- wait a minute until inversion terminates and VELOIT100.SRF is shown in *Surfer*
- switch with ALT-TAB to *Golden Software Surfer* application
- CTRL-TAB to VELOIT100.SRF in Surfer
- select *View|Object Manager* in Surfer
- double-click with left mouse key on *Image label* in Object Manager, at left screen margin
- left-click on *Scale tab* of *Map: Image Map Properties dialog*
- uncheck *Proportional XY Scaling*
- set *X Scale Length* to 1.0 in
- click on *Apply button*
- left-click on *General tab* of *Map: Image Map Properties dialog*
- left-click on *Color Spectrum*
- set *Maximum* to 1,200 (in m/s)
- click *OK button* and again click *OK button*
- adjust scale of COVERG100.SRF as above, leave color spectrum alone

Such single-offset VSP surveys can be interpreted reliably with our software if the shot point is located closely (0.5 to 1.0 receiver spacings) to the borehole top only.

For shot point offset between 1.0 and 2.0 receiver spacings from borehole top, increasing *WET wavepath width* e.g. doubling it keeps the VSP tomogram horizontally layered, but decreases vertical resolution.

We thank our Swiss client GeoExpert ag for making available this VSP data set.