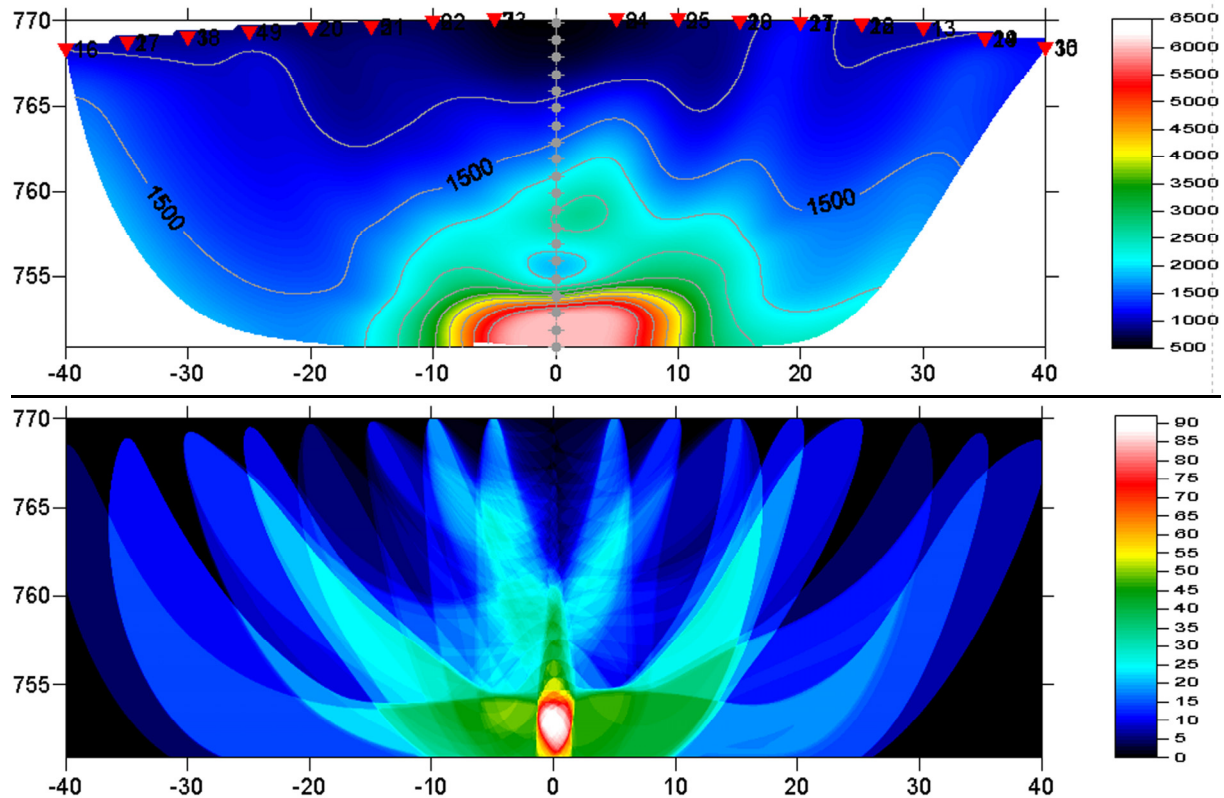Smooth inversion of Walkaway (multi-offset) VSP seismic survey, with constant-velocity initial model :

Borehole *station spacing* 1m, shot interval 5m, 200 WET iterations with default WET parameters and settings. Top : velocity tomogram in m/s . Bottom : first break energy and wavepath coverage, in paths/grid cell .

To invert the data with version 3.09 of our software, please proceed as follows :

- create a new profile database named WALKAWAY 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 Walkaway VSP survey file from http://rayfract.com/samples/walkaway.zip
- copy WALKAWAY.ZIP into \RAY32\WALKAWAY\INPUT, unzip to obtain WALKAWAY.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 all crosshole shots. Leave all parameters at shown values.
- uncheck option *WET Tomo|WET tomography Settings|Blank|Blank outside borehole tomogram*
- review traveltimes in *Refractor|Shot breaks* as usual. See our manual, chapter 1.3.
- check Post…and Label… menu items at bottom of *Grid menu*, to show sources and receivers on tomogram
- select *Smooth invert|Precompute static Beydoun weight matrix* , for conservative weighting . See http://rayfract.com/help/release_notes.pdf , notes for versions 3.02 and 3.03 .
- 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 200 .
- click on *Start tomography processing* and confirm prompts.

The symmetrical lateral velocity variation (sharp layer boundaries at borehole in center of tomogram, blurred layer boundaries at left/right margins of tomogram) is an artefact of the recording geometry. You may want to **gather multi-offset VSP traces by common borehole receiver**, for multiple boreholes. See a13r1dm.pdf . Then record a refraction spread line along the same profile, and import these "inverted VSP" shots as uphole shots, with shot hole depth matching the borehole receiver. See coffey04.pdf . This will give you a better angular coverage with rays/wave paths and more robust inversion output along the profile.

For instructions on how to import and invert above data with version 3.36 of our software see Walkaway19.pdf .

We thank our Australian client Coffey Geotechnics Pty Ltd. for making available this VSP data set.