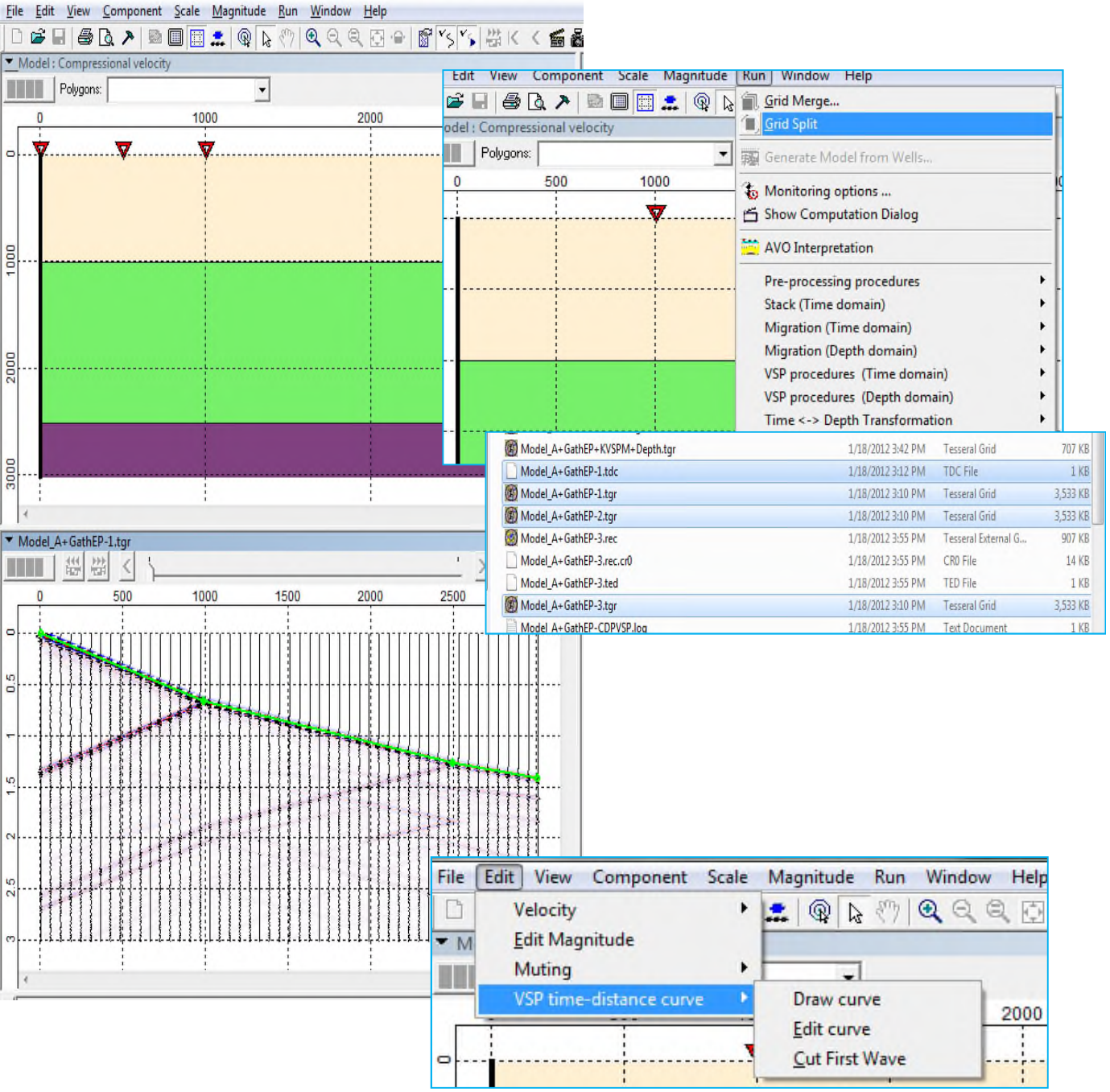
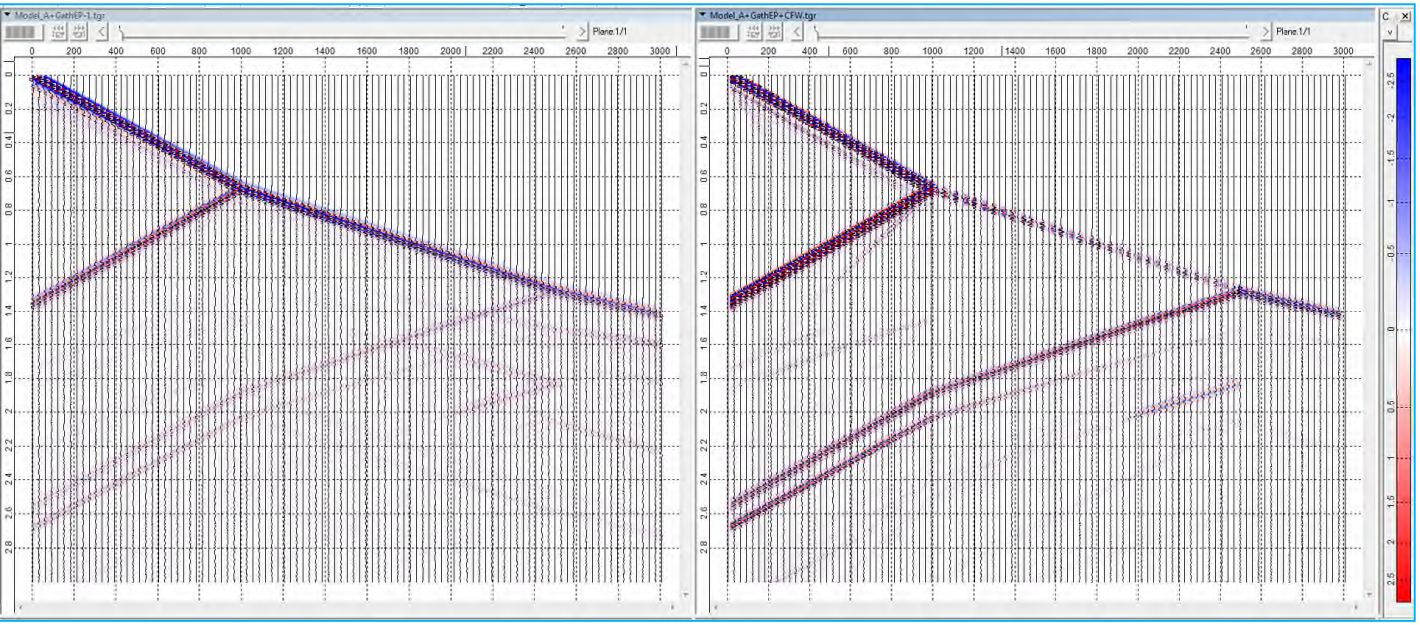
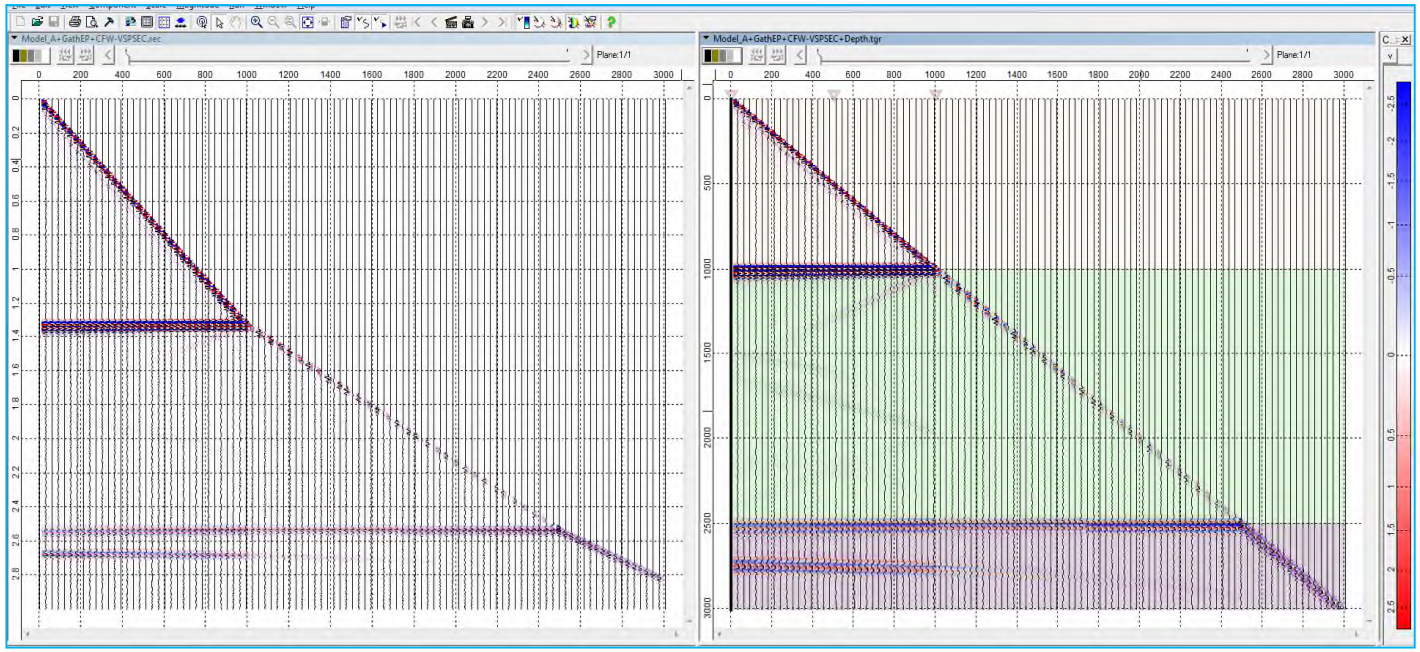
Processing in Tesseral for VSP data

www.tesseral-geo.com

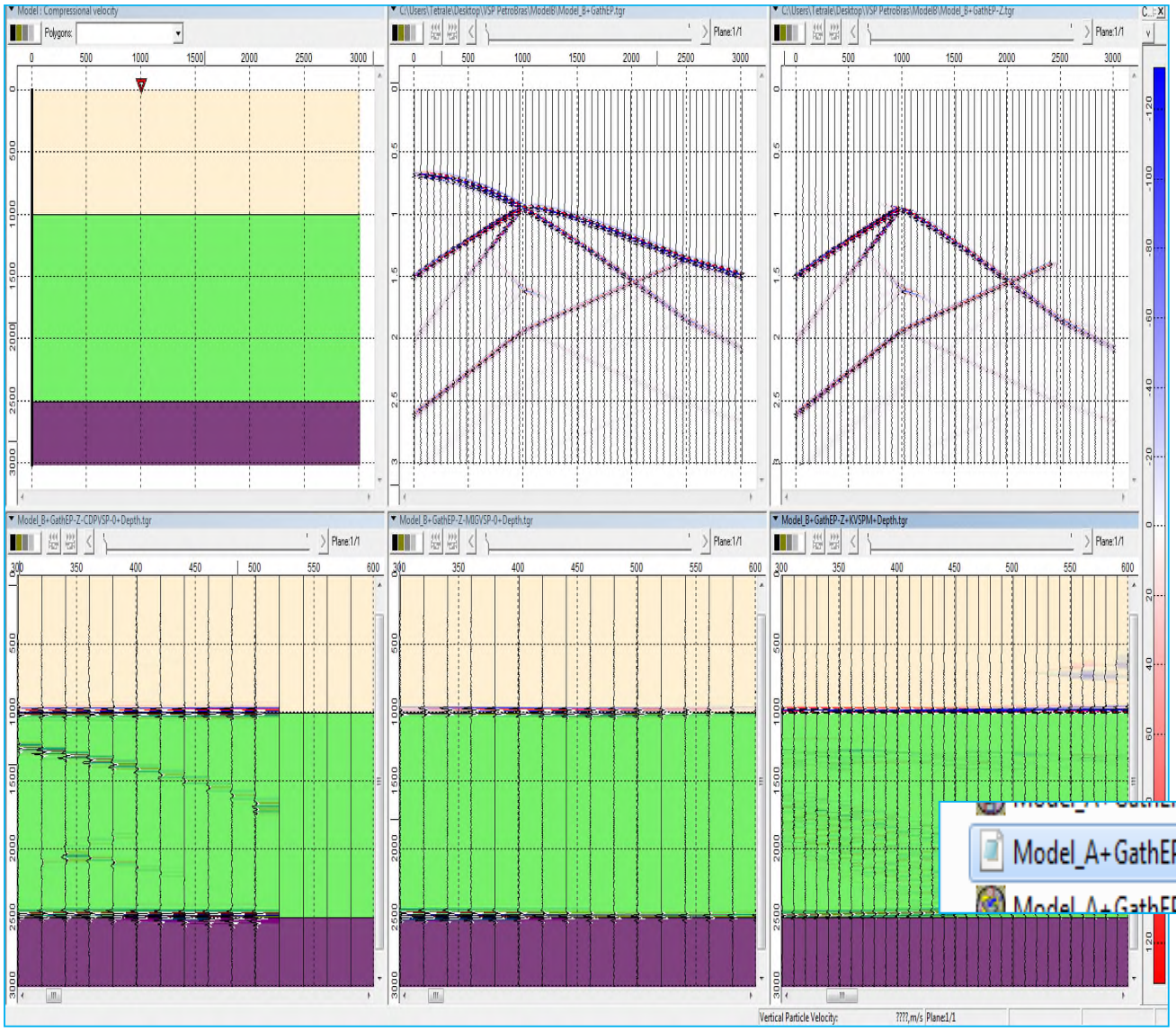


We usually shoot a couple of shots, one with a zero offset from the well and several more with different offsets, which gives us possibility to run different processing procedures. After receiving of combined gathers we need to split them to separate ones, to do that you should be in gather screen. Gather with zero offset is used to pick first breaks.

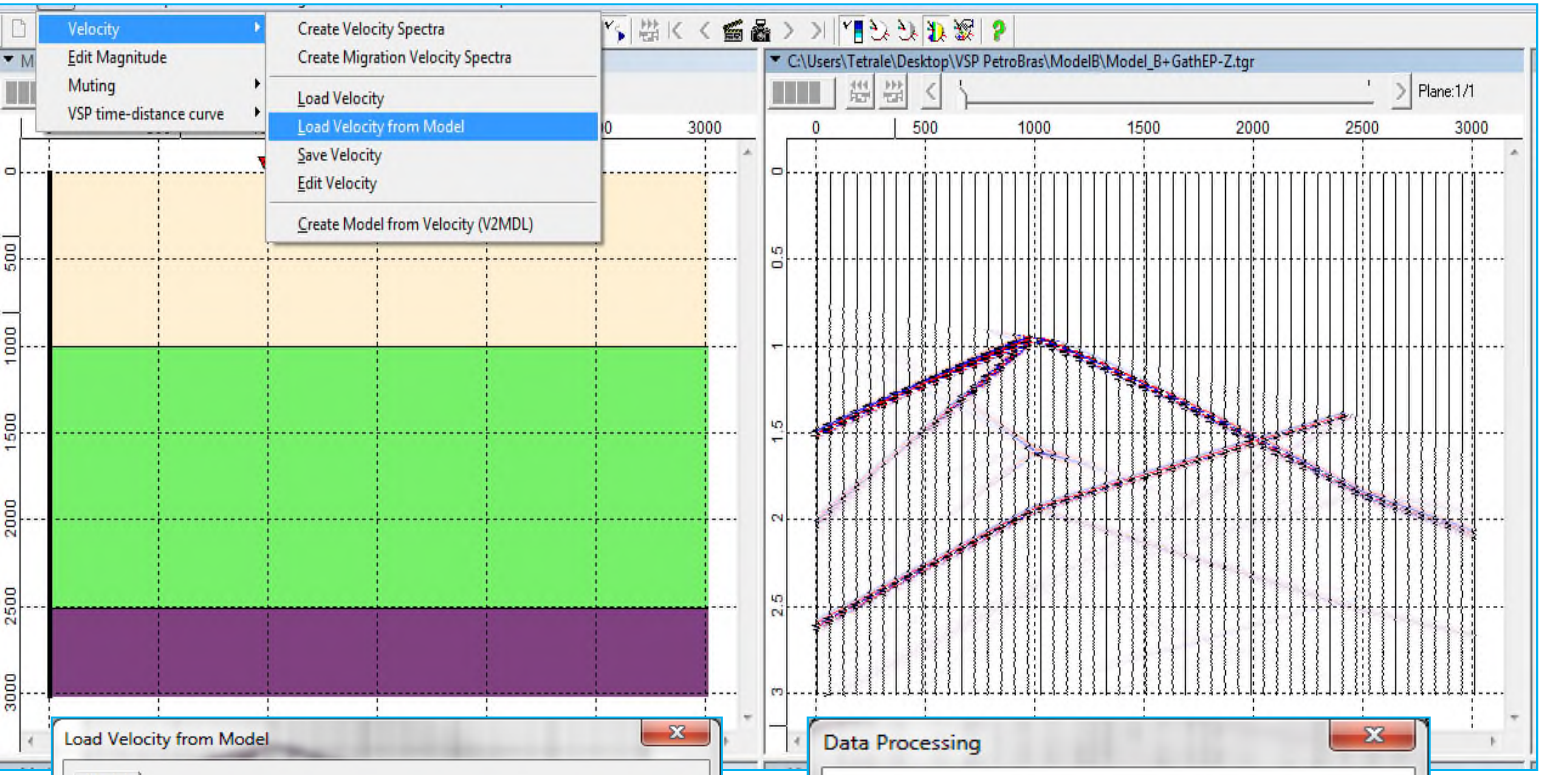


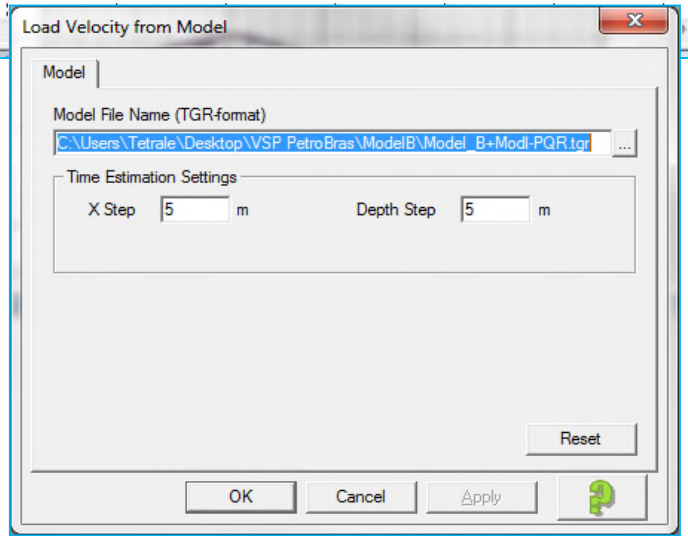


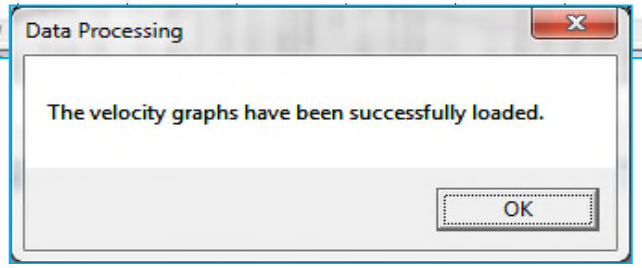
After picking of first breaks and subtracting them from the gather we can perform "VSP Section“ procedure to see how well we can delineate our geological model.



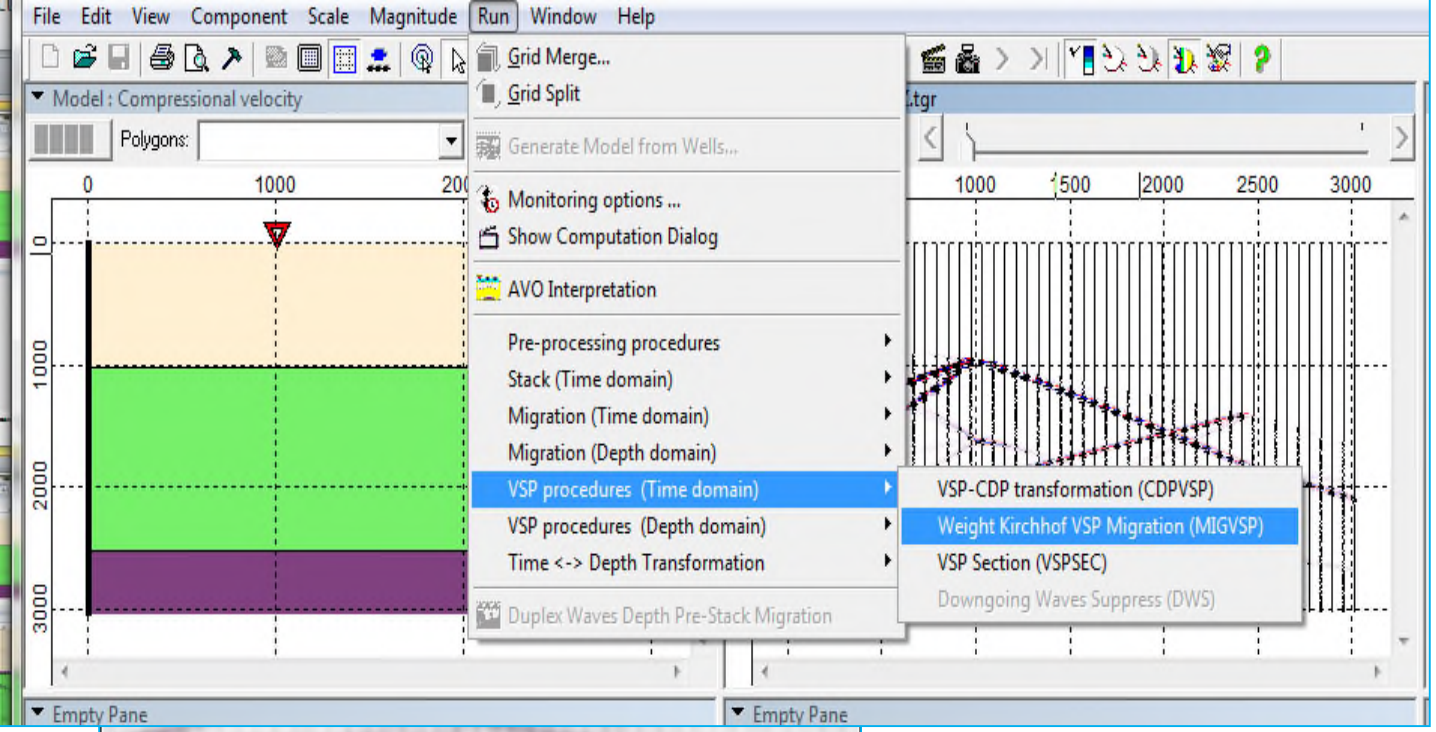
For any gather with non zero offset from the well we can perform the following processing procedures such as CDPVSP, MIGVSP and KVSPM. In this case first breaks can be cut by muting.

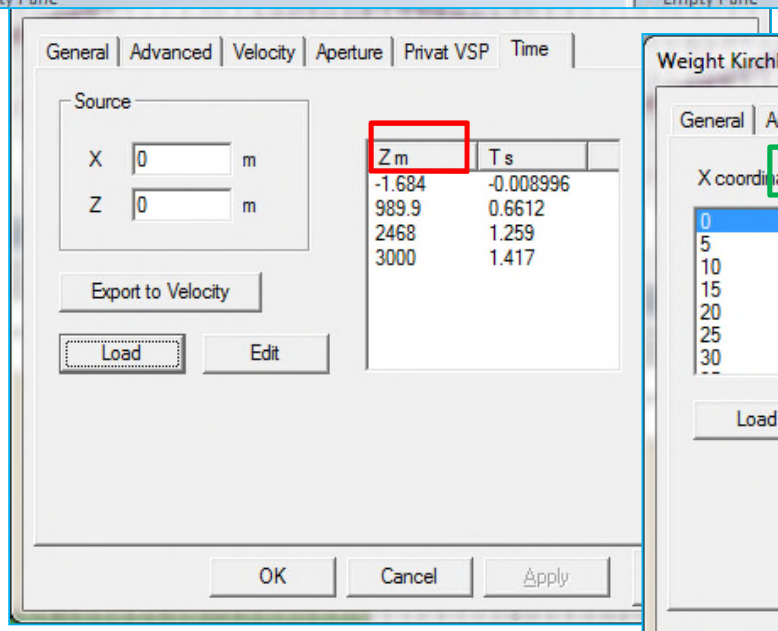


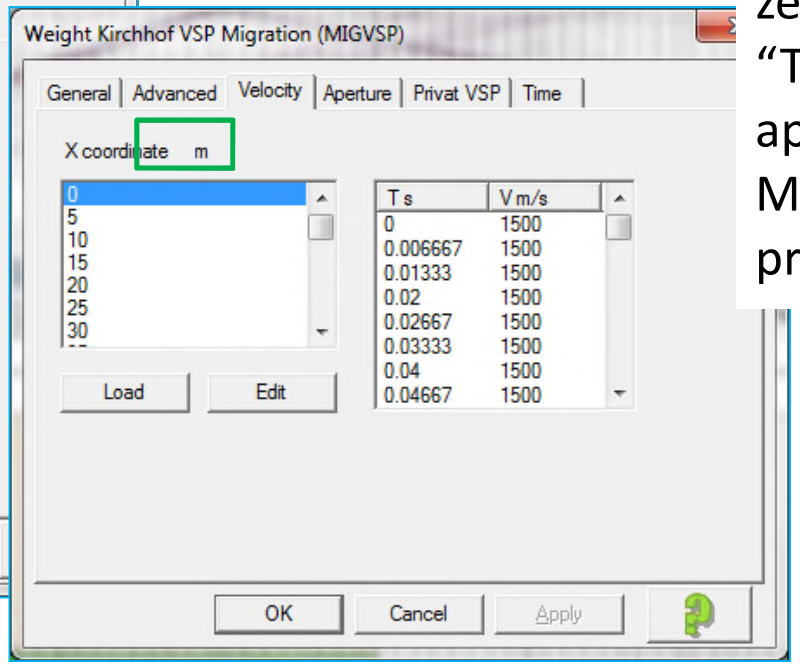




Because we shot our synthetic gathers using a model, the best matching velocities can be taken from this model itself. We need to be in a gather screen and load these velocities from PQR file





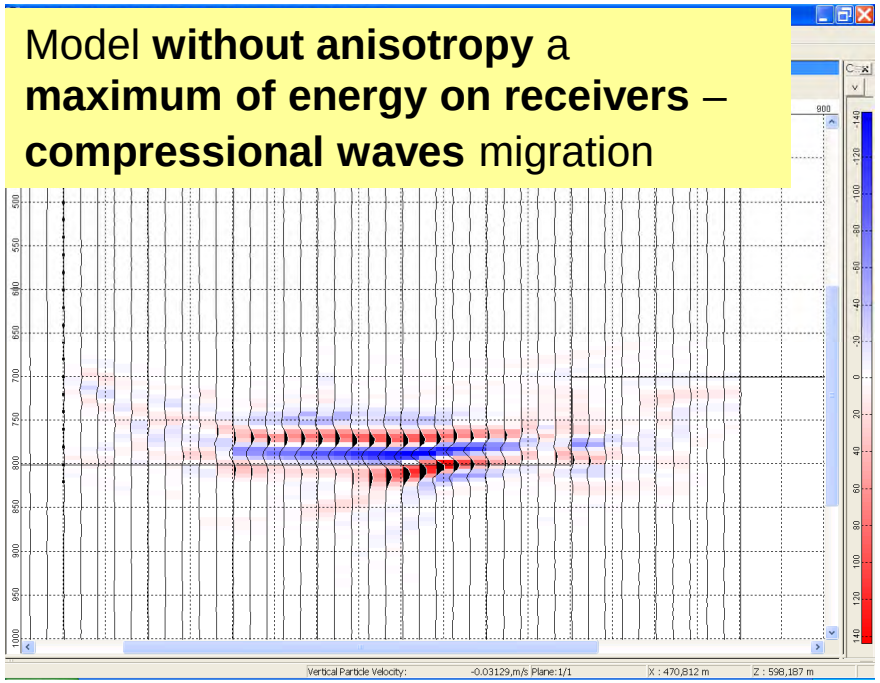


To run CDPVSP, MIGVSP and KVSPM processing procedures we need to be in a gather screen. Velocity file is already loaded so we need to load a first breaks graph from shot with zero offset in “Time”, pick aperture and run MIGVSP procedure.

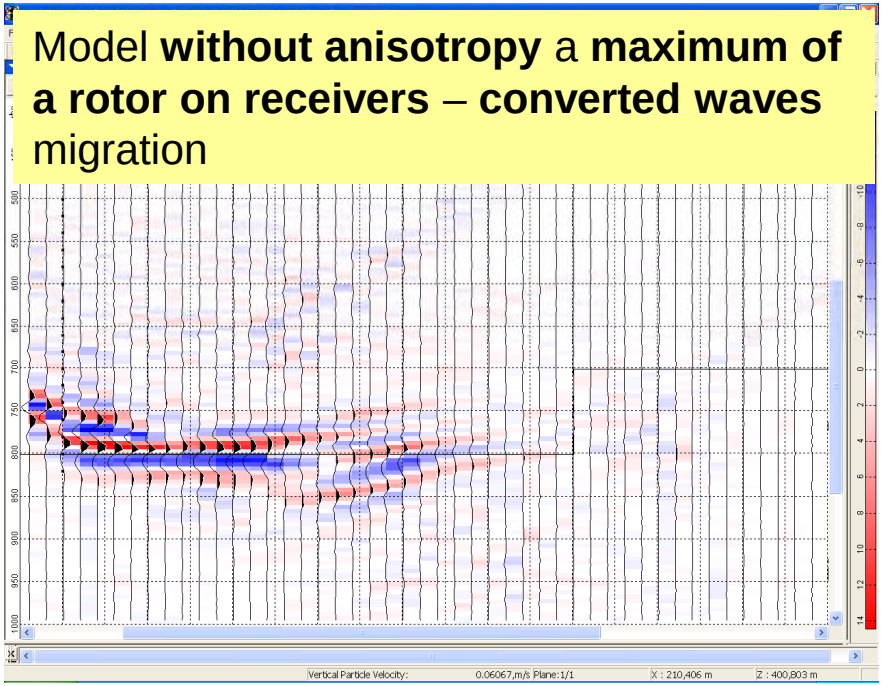
Depth Pre-stack Migration for VSP data

VSP depth migration for sub-horizontal boundaries

Model **without anisotropy** a **maximum of energy on receivers** – **compressional waves** migration

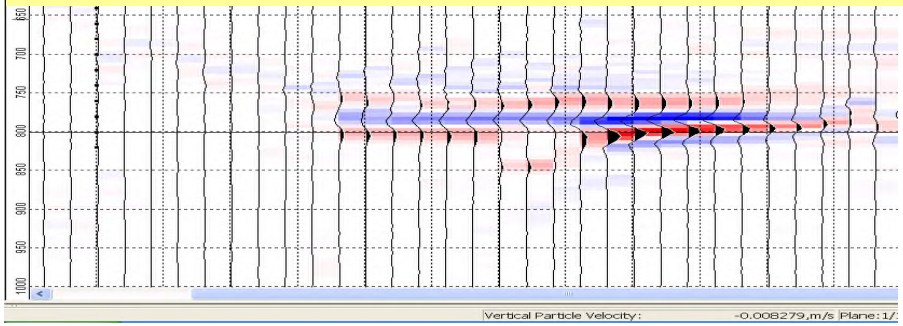


Model **without anisotropy** a **maximum of a rotor on receivers** – **converted waves** migration

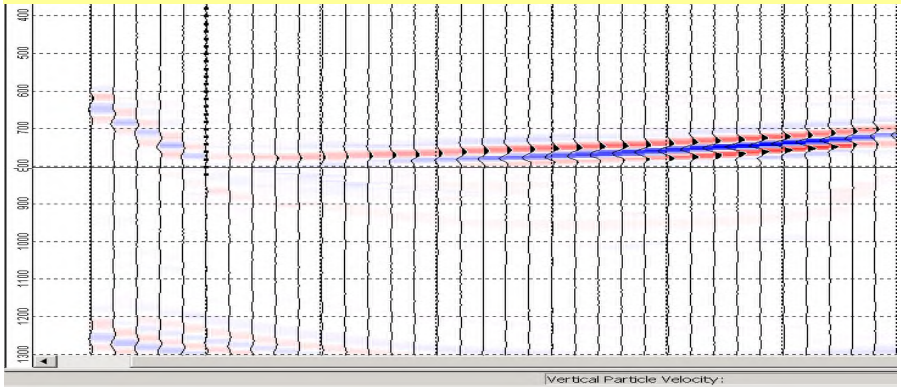


VSP depth migration for sub-horizontal boundaries - anisotropy

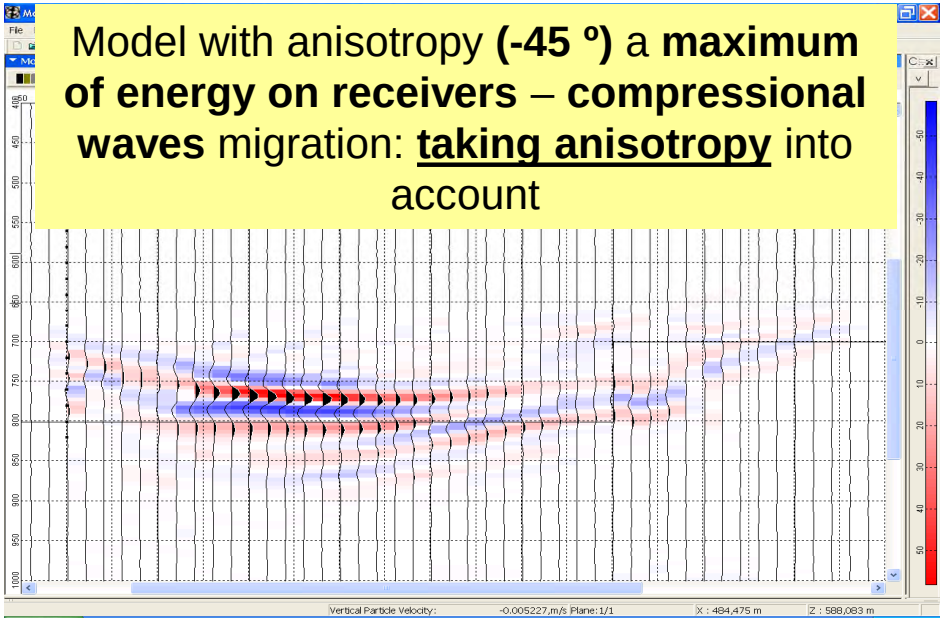
Model **with anisotropy** (angle of inclination of anisotropy axis **45º,** Thompsen's parameters: ε=0.2, δ=0.1) a **maximum of energy on receivers** – **compressional waves** migration: **taking anisotropy** into account



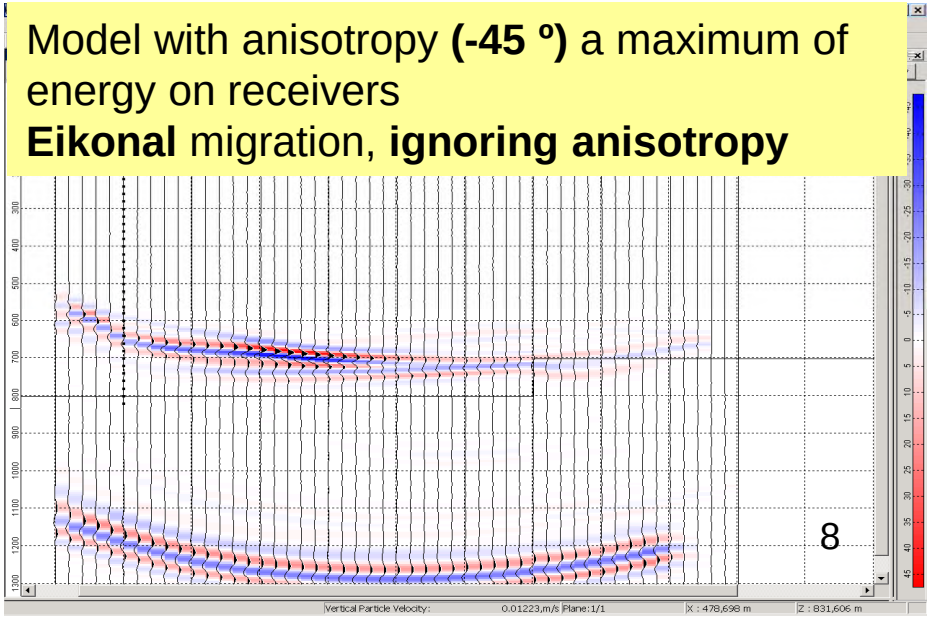
Model **with anisotropy** (angle of inclination of anisotropy axis **45º,** Thompsen's parameters ε=0.2, δ=0.1)) **Eikonal** migration, **ignoring anisotropy**



Model with anisotropy **(-45 º)** a **maximum of energy on receivers** – **compressional waves** migration: **taking anisotropy** into account

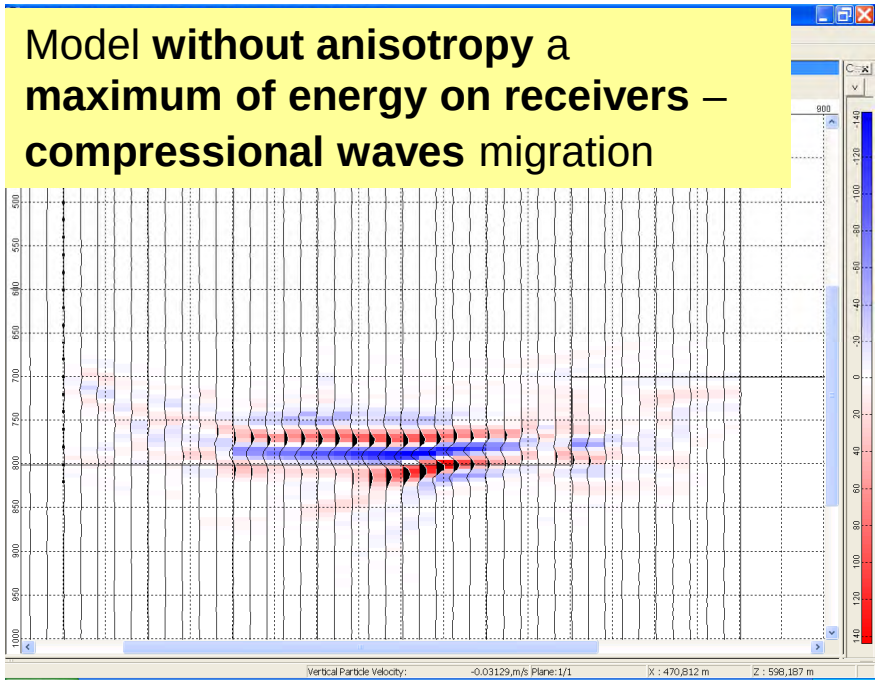


Model with anisotropy **(-45 º)** a maximum of energy on receivers
Eikonal migration, **ignoring anisotropy**

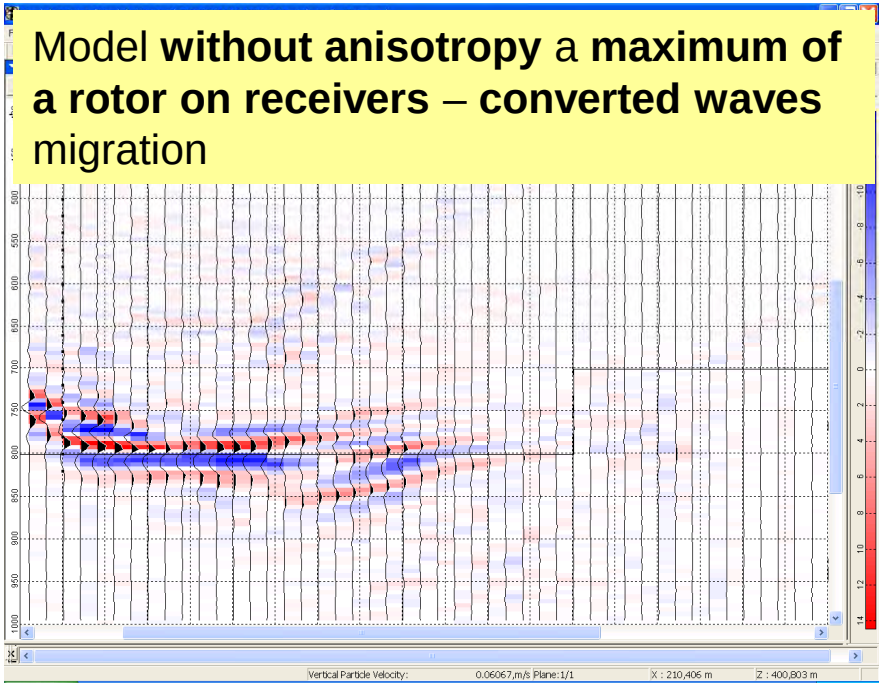


VSP depth migration for sub-horizontal boundaries

Model **without anisotropy** a **maximum of energy on receivers** – **compressional waves** migration

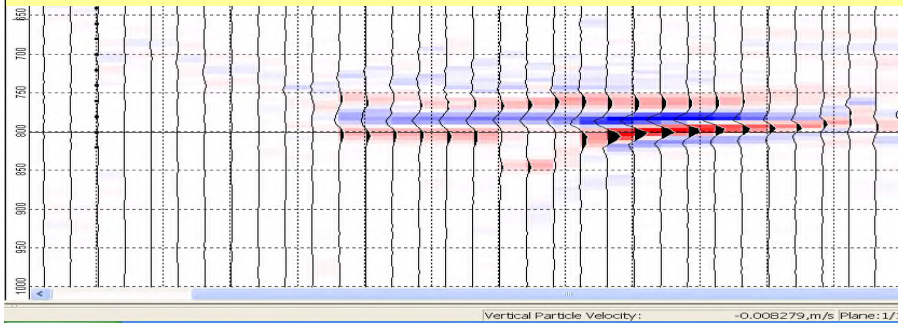


Model **without anisotropy** a **maximum of a rotor on receivers** – **converted waves** migration

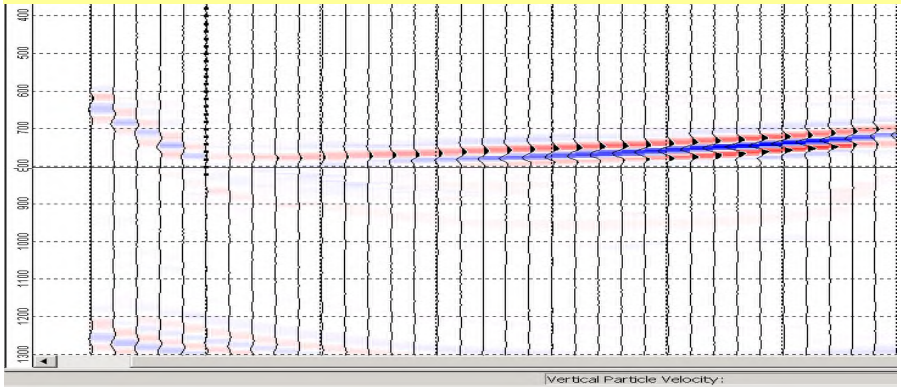


VSP depth migration for sub-horizontal boundaries - anisotropy

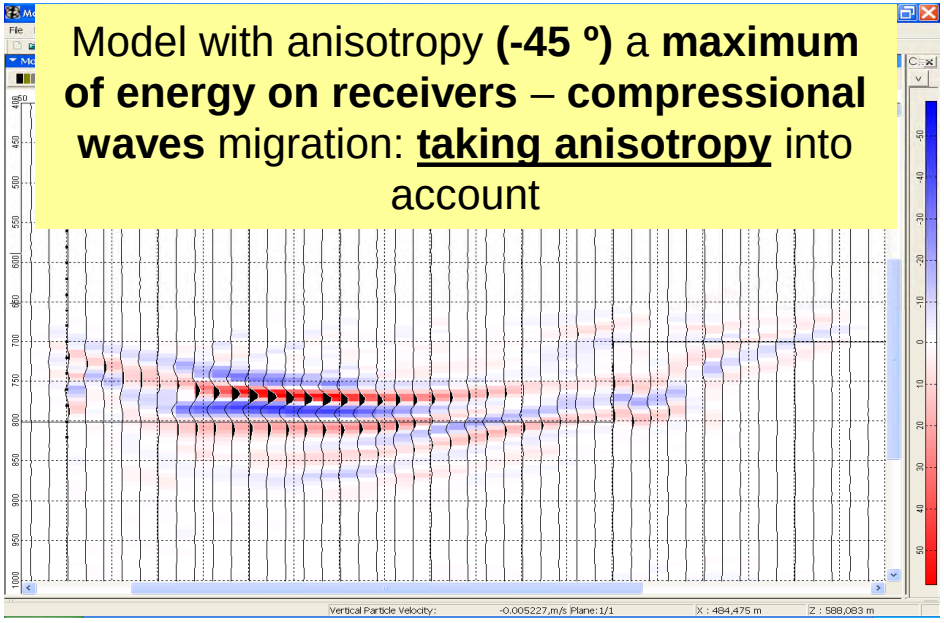
Model **with anisotropy** (angle of inclination of anisotropy axis **45º,** Thompsen's parameters: ε=0.2, δ=0.1) a **maximum of energy on receivers** – **compressional waves** migration: **taking anisotropy** into account



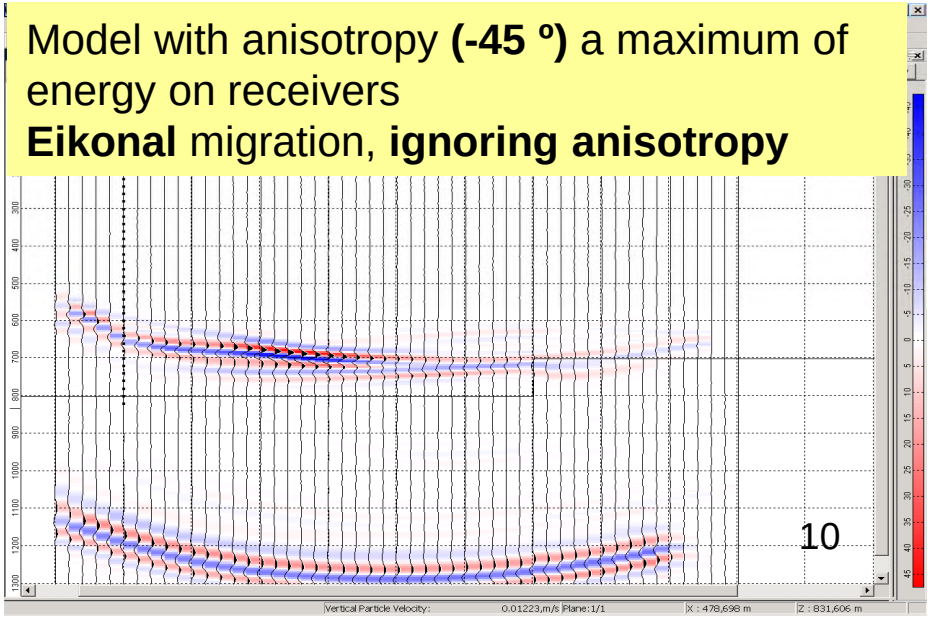
Model **with anisotropy** (angle of inclination of anisotropy axis **45º,** Thompsen's parameters ε=0.2, δ=0.1)) **Eikonal** migration, **ignoring anisotropy**



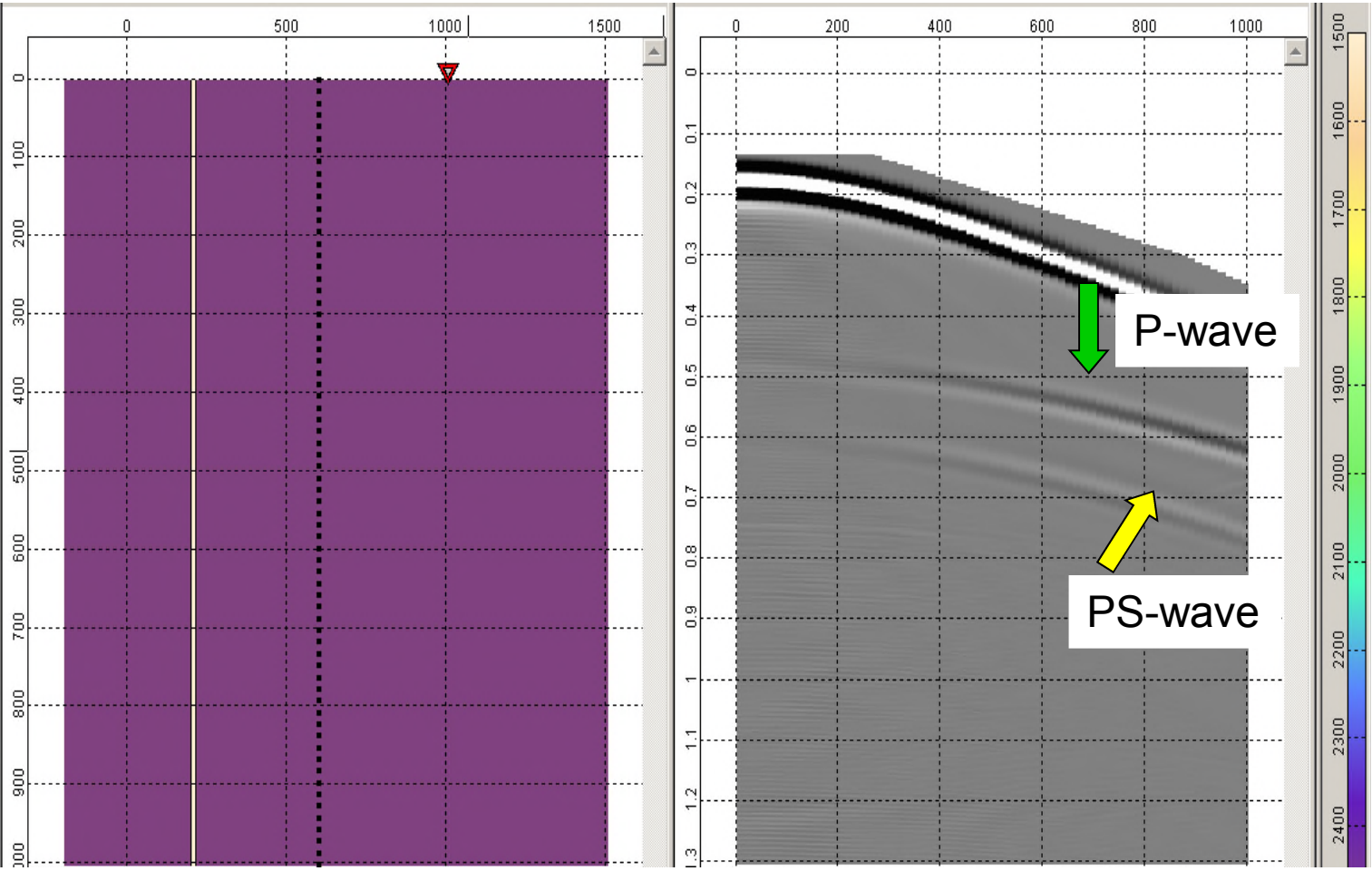
Model with anisotropy **(-45 º)** a **maximum of energy on receivers** – **compressional waves** migration: **taking anisotropy** into account



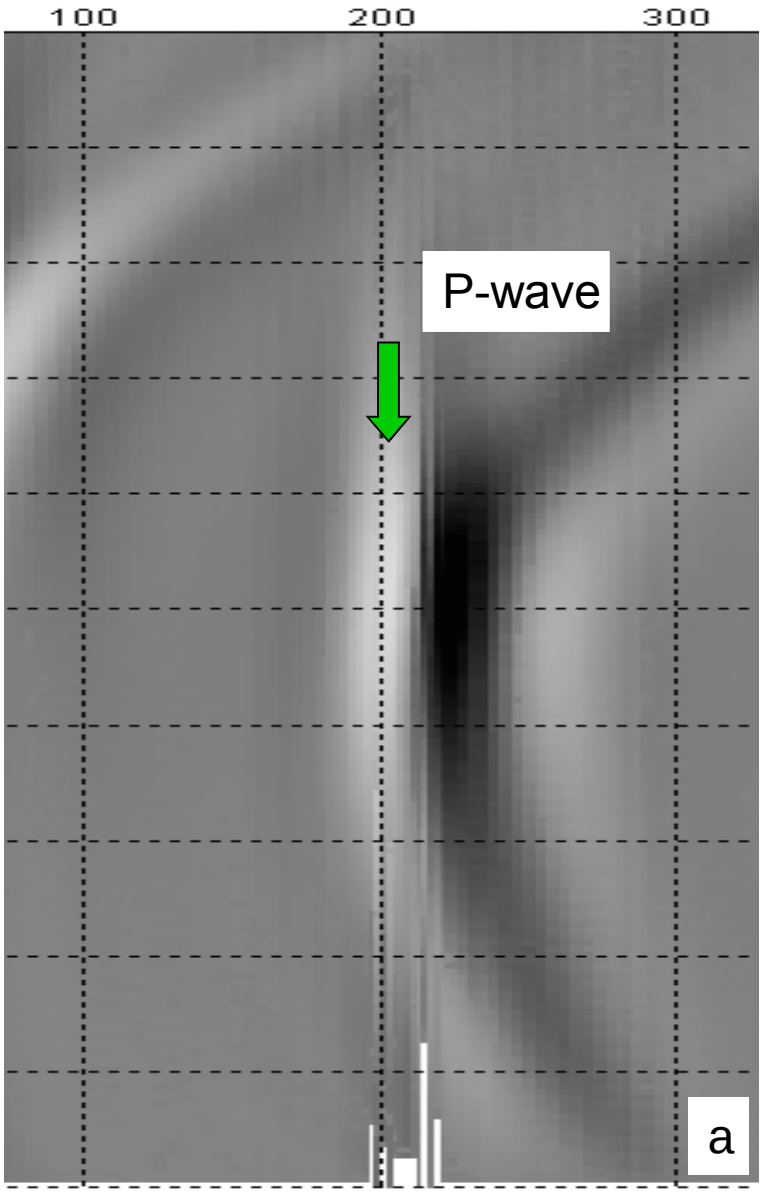
Model with anisotropy **(-45 º)** a maximum of energy on receivers
Eikonal migration, **ignoring anisotropy**

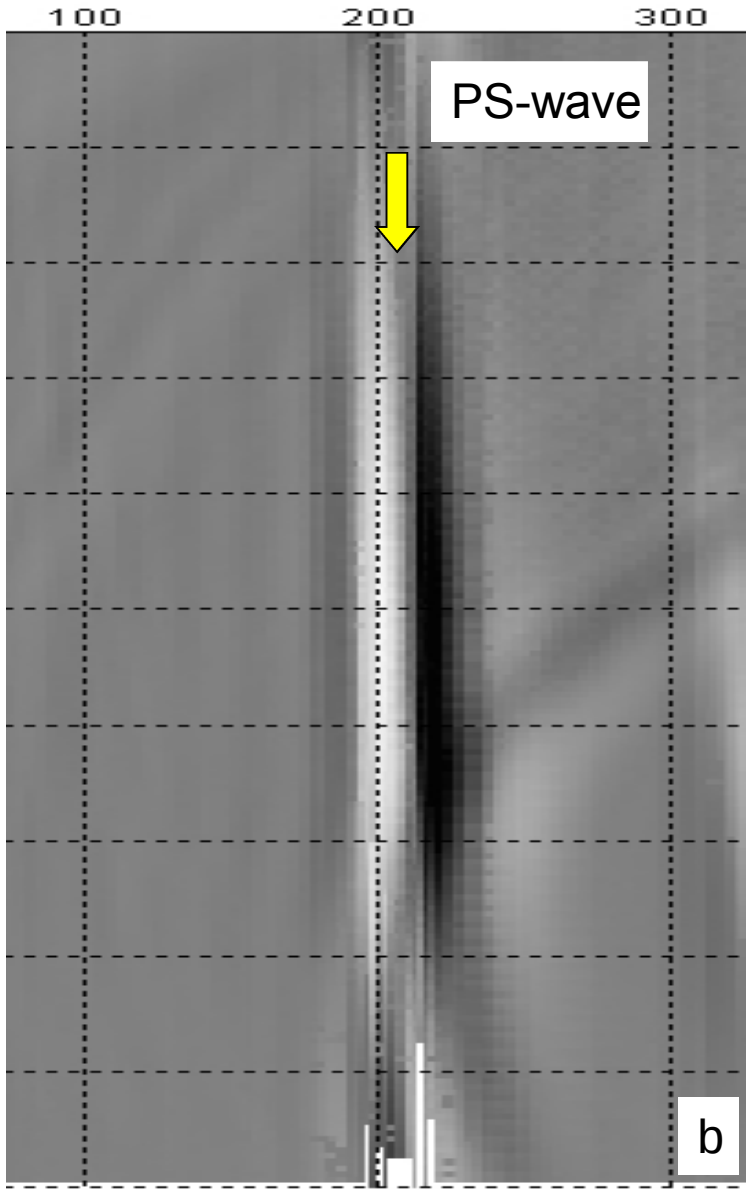


Formation of image of sub-vertical boundary by VSP data



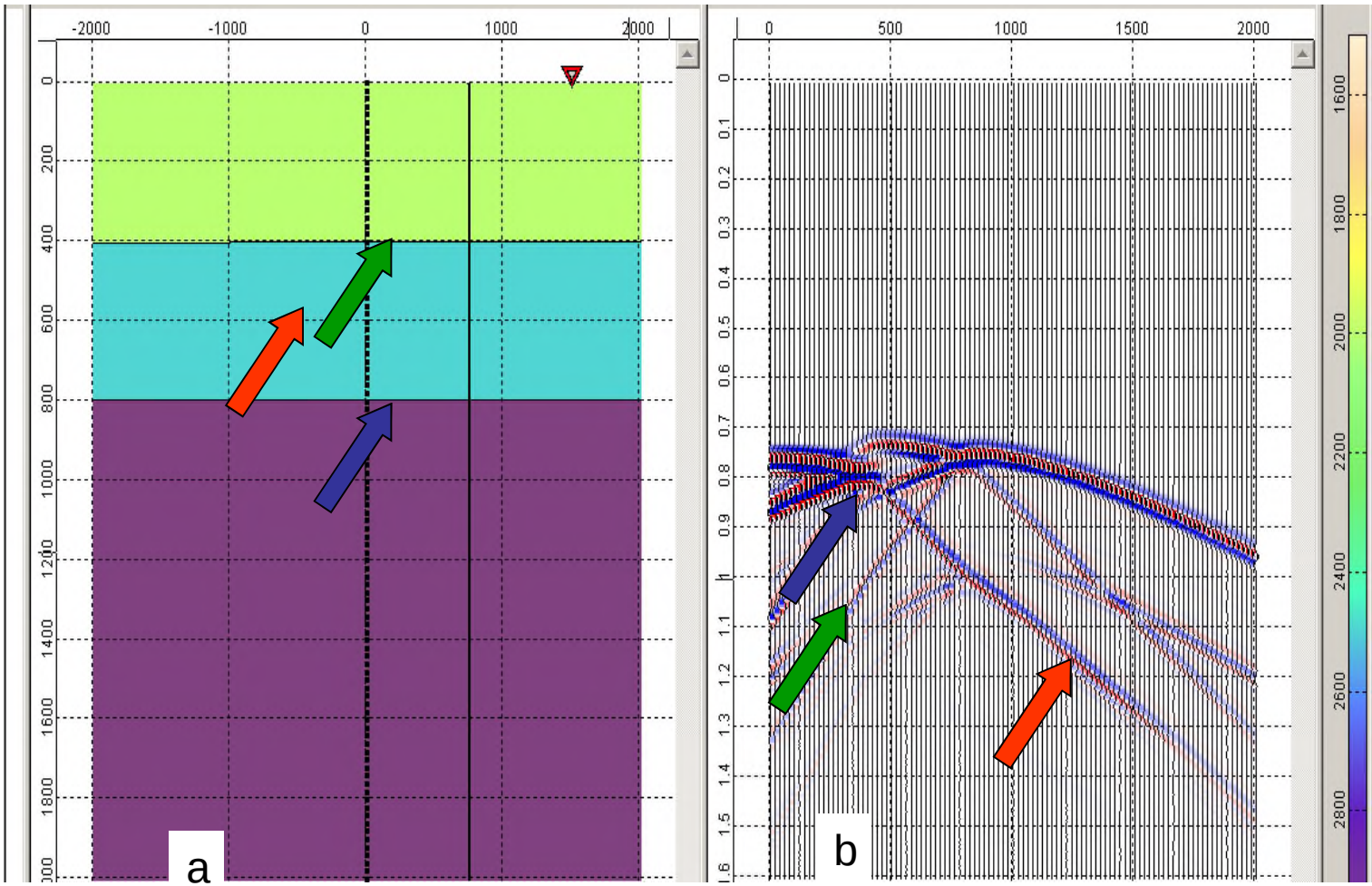
Model **VSP shotgather**





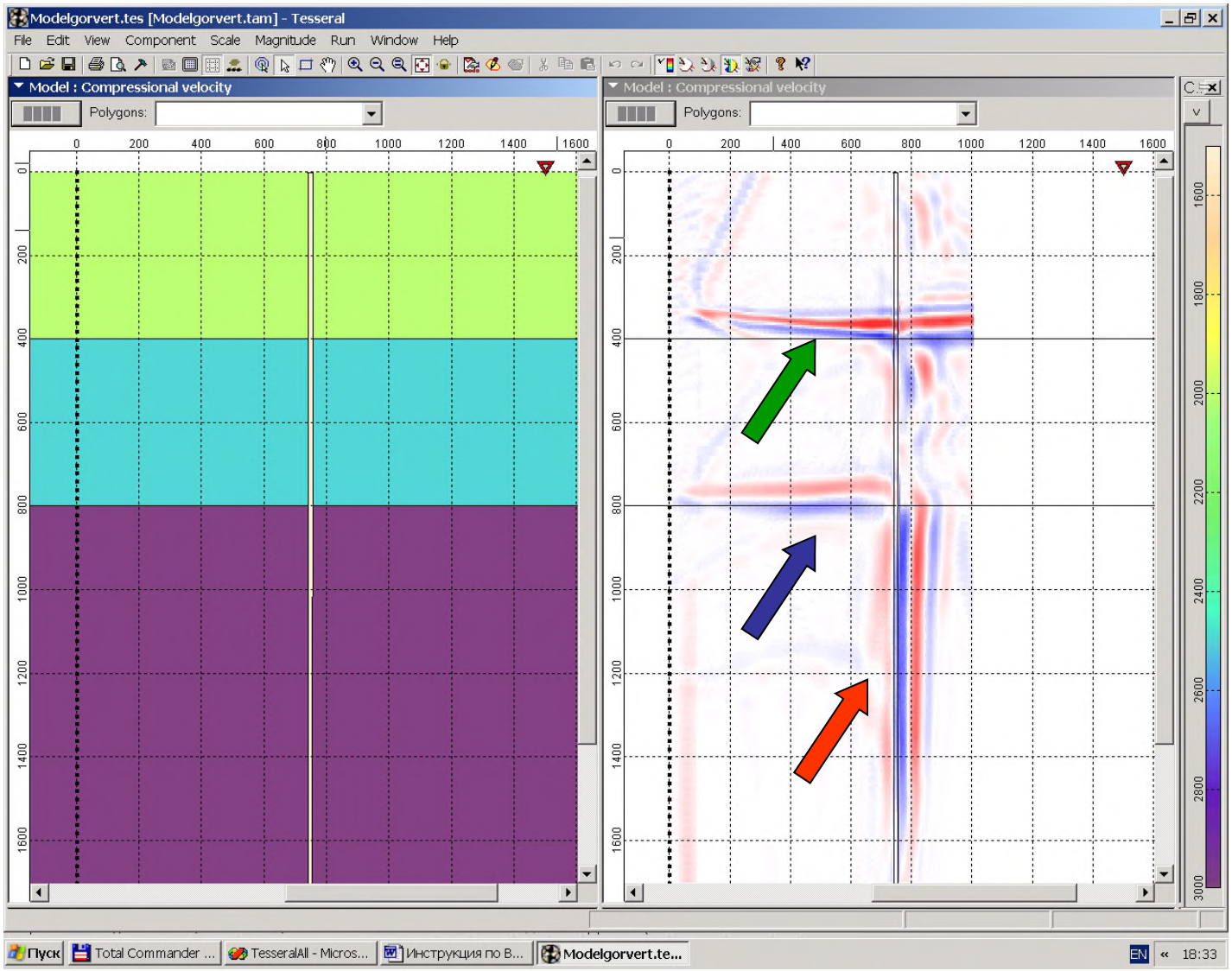
Vertical image: a –reflected compressional waves, b –converted reflected waves.

Seismic images of horizontal and vertical boundaries on transmitted converted waves at VSP

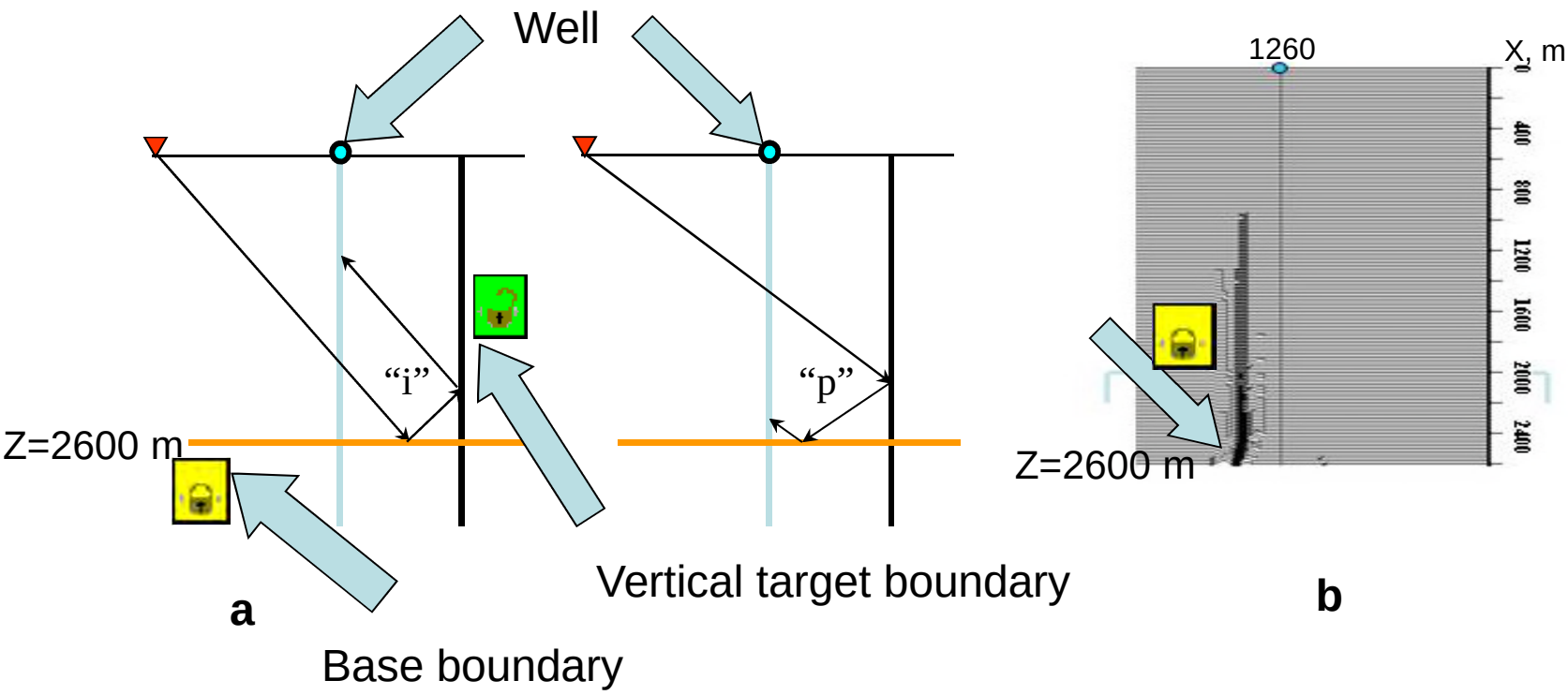


a – MODEL, b – VSP shotgather: with green arrow the transmitted converted wave from the first boundary is shown; blue arrow – transmitted converted wave of the second boundary, red arrow - a transversal converted wave from vertical boundary

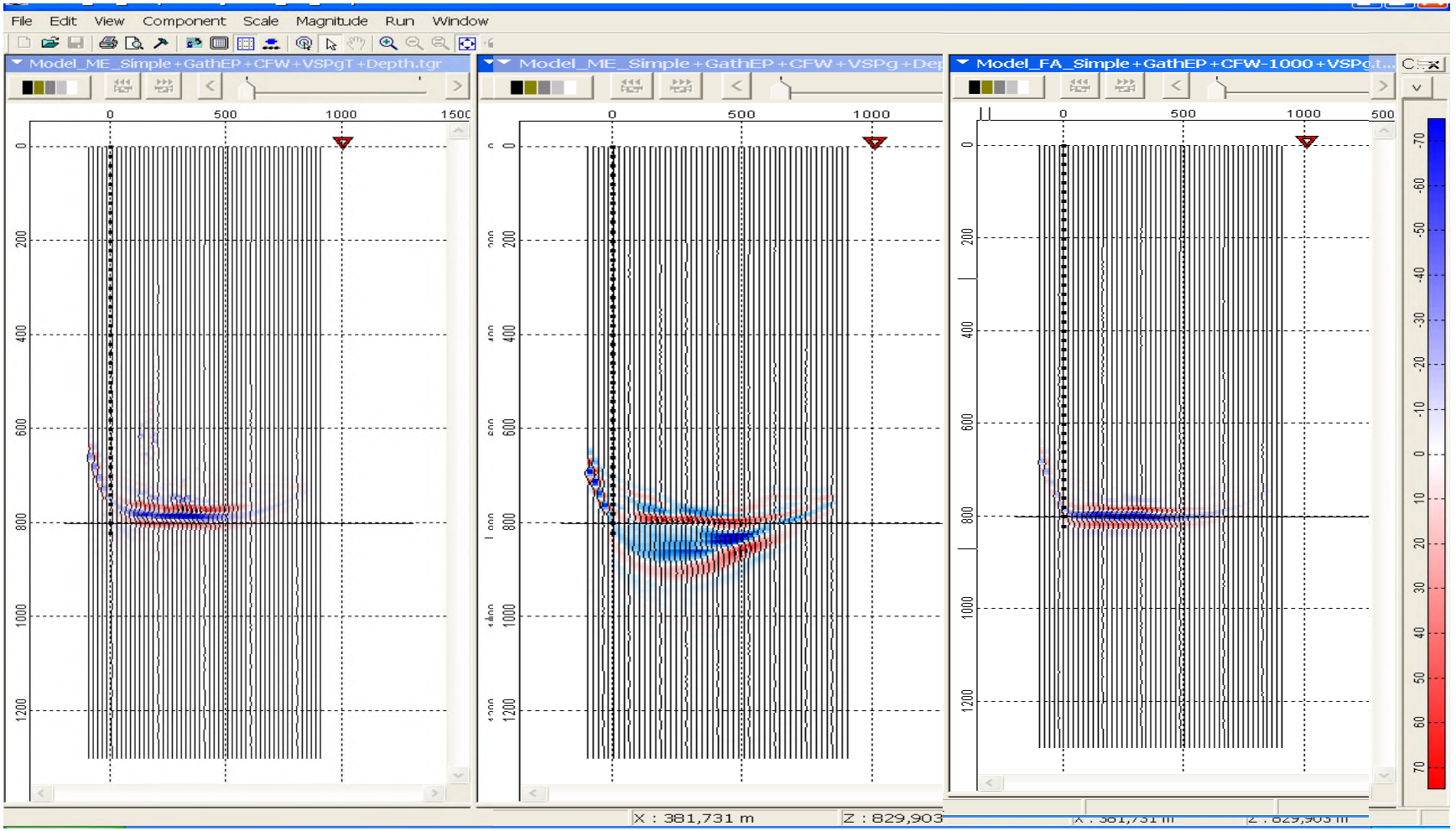
VSP Depth Migration on transmitted converted waves. Simultaneous formation of sub-horizontal and sub-vertical boundaries



Duplex wave migration for VSP data



Schemes of duplex waves at VSP (a), image of vertical boundary (b), obtained in result of depth duplex waves migration of VSP data



a **b** **c**

VSP Depth Migration on sharp reflecting boundary:
a – the Energy operator, b – the First arrivals operator, c - the First arrivals operator with exclusion of sharp boundary.

End of Presentation