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Tomographic inversion of $P410s$ delay times for simultaneous determination of P and S velocities in the upper mantle of the Baltic shield.

S. Olsson (1), R. Roberts (1), H. Shomali (1,2)

(1) Uppsala University, Uppsala, Sweden, (2) Geological Survey of Sweden, Uppsala, Sweden (Sverker.Olsson@geo.uu.se)

Teleseismic data recorded by broadband stations of the Swedish National Seismological Network have been used to study waves converted from P to S at upper mantle discontinuities. Observed delay times of converted waves are generally 1-2 seconds less than predicted by global reference models such as IASP91 or PREM. This is what should be expected for a shield area like the Baltic shield. On a global scale, several studies have found a good correlation between $P410s$ delay times observed in receiver function studies and upper mantle velocity models obtained by other methods. It is therefore a fair guess to attribute most of the early arrivals of converted waves observed for this area to anomalous upper mantle velocities rather than anomalous conversion depth. Also, the variation in delay times observed along the network can be explained by variation of upper mantle velocities. In an attempt to resolve variation in upper mantle velocities, we have used the observed $P410s$ delay times as input for tomographic inversion. For this, we make the assumption that P to S conversion takes place at a fixed depth (410 km) and that any variation in $P410s$ delay times observed along the network be due to variation in P and S velocities in the uppermost mantle. The delay time of a seismic wave converted from P to S at a fixed depth depends on both P and S velocity variation along two different propagation paths. With the assumptions made, $P410s$ delay times can easily bet set up as a tomographic equation to solve for both P and S velocity models simultaneously.

Results of the inversion using different damping and smoothing parameters are presented and compared to existing velocity models for the area. For the P velocity model, agreement with velocity models obtained by arrival time tomography is very good.