Geophysical Research Abstracts
Vol. 15, EGU2013-2187, 2013
EGU General Assembly 2013

Seismic LAB or LID? The Baltic Shield Case

Marek Grad (1), Timo Tiira (2), Sverker Olsson (3), and Kari Komminaho (2)

(1) University of Warsaw, Faculty of Physics, Institute of Geophysics, Warsaw, Poland, (2) University of Helsinki, Institute of Seismology, Helsinki, Finland, (3) Uppsala University, Department of Earth Sciences, Uppsala, Sweden

The problem of the asthenosphere for old Precambrian cratons, including East European Craton and its part – the Baltic Shield, is still discussed. To study the seismic lithosphere-asthenosphere boundary (LAB) beneath the Baltic Shield we used records of 9 local events with magnitudes in the range 2.7-5.9. The relatively big number of seismic stations in the Baltic Shield with a station spacing of 30-100 km permits for relatively dense recordings, and is sufficient in lithospheric scale. For modelling of the lower lithosphere and asthenosphere, the original data were corrected for topography and the Moho depth for each event and each station location, using a reference model with a 46 km thick crust. Observed P and S arrivals are significantly earlier than those predicted by the iasp91 model, which clearly indicates that lithospheric P and S velocities beneath the Baltic Shield are higher than in the global iasp91 model. For two northern events at Spitsbergen and Novaya Zemlya we observe a low velocity layer, 60-70 km thick asthenosphere, and the LAB beneath Barents Sea was found at depth of about 200 km. Sections for other events show continous first arrivals of P waves with no evidence for "shadow zone" in the whole range of registration, which could be interpreted as absence of asthenosphere beneath the central part of the Baltic Shield, or that LAB in this area occurs deeper (>200 km). The relatively thin low velocity layer found beneath southern Sweden, 15 km below the Moho, could be interpreted as small scale lithospheric inhomogeneities, rather than asthenosphere. Differentiation of the lid velocity beneath the Baltic Shield could be interpreted as regional inhomogeneity. It could also be interpreted as anisotropy of the Baltic Shield lithosphere, with fast velocity close to the east-west direction, and slow velocity close to the south-north direction.