Geophysical Research Abstracts
Vol. 19, EGU2017-11773-1, 2017
EGU General Assembly 2017

Preliminary Results on Scandinavian Lithospheric Structure Revealed by Joint Analysis of Receiver Functions and Surface Wave Dispersion

Anna Makushkina (1), Hrvoje Tkalčić (2), Seongryong Kim (2), Irina Artemieva (1), and Hans Thybo (3)

(1) University of Copenhagen, Department of Geosciences and Natural Resource Management, Copenhagen, Denmark, (2) The Australian National University, Research School of Earth Sciences, Canberra, Australia, (3) University of Oslo, Centre for Earth Evolution and Dynamics, Oslo, Norway

Scandinavia is a very complicated region for the deep seismic imaging. It consists of highly heterogeneous domains, and little is known about its internal structure. This study aims at imaging the lithosphere of Scandinavia using continuous records from seismic stations temporary deployed across Norway and Sweden by ScanArray experiment in 2012-2016.

The recorded waveforms are characterized by a relatively high level of noise and a relatively small amount of records with good signal-to-noise ratio suitable for receiver function (RF) analysis. To moderate this problem we use a large number of receivers that form a dense spatial network and a complementary dataset of surface wave dispersion curves.

Comparison of the results obtained by different state-of-the-art techniques: a joint inversion of P- and S-wave RF and a joint inversion of P-wave RF and surface wave dispersion (SWD) (initially, group velocity curves were extracted from the global model LITHO1.0), revealed the presence of a low shear-wave velocity zone, however, different methods determine different depth for this zone. A joint inversion of P- and S-wave RFs, computed through an adaptive simulated annealing algorithm, gives the depth of 20 to 30 km, while a joint inversion of P-wave RF and SWD within the Bayesian hierarchical framework gives the depth of 10 to 20 km.

To resolve this disagreement, we obtain path-averaged group velocity curves from ambient noise for our stations, which improves the results of the joint inversion of P-wave RF and SWD. To calculate group velocity at each station location, we first obtain the Rayleigh wave group velocity curves for station pairs located within the radius of 150 km from the station of interest. We then obtain an average dispersion curve from all the group velocity measurements in the area and calculate its standard deviation. This methodology gives good constraint on path-averaged SWD for the Bayesian joint inversion in the area of study as opposed to taking SWD from a global model.