Geophysical Research Abstracts
Vol. 12, EGU2010-4535, 2010
EGU General Assembly 2010

Seismic structure in the crust and upper mantle beneath Alaska from tomographic inversion of worldwide and regional data

Kirill Gadylshin (1) and Ivan Koulakov (2)

(1) A.A. Trofimuk Institute of Petroleum Geology and Geophysics SB RAS (gadylshin@yahoo.com), (2) A.A. Trofimuk Institute of Petroleum Geology and Geophysics SB RAS (ivan.science@gmail.com)

We present two independently obtained models of seismic structure beneath Alaska. First model is based on inversion of worldwide data from the ISC catalogue based on the regional tomography algorithm (Koulakov, Sobolev, 2007, GJI). This algorithm uses the travel times from events located in the study area recorded by worldwide stations, as well as data from teleseismic events recorded by stations in the study region. Computed P and S anomalies in the upper mantle clearly depict the shape of the subducted Pacific slab in the upper mantle which fits with relocated events in the Benioff zone. Second model of the crust and uppermost mantle is based on processing of regional network data provided by the Alaska Earthquake Information Center. This model was computed using the LOTOS code for local earthquake tomography (Koulakov, 2009, BSSA), which includes the absolute source location, optimization of the starting 1D velocity model, and iterative tomographic inversion for 3D seismic P, S velocities, Vp/Vs ratio and source parameters. Special attention is paid to verification of the obtained results. In order to estimate the random factors, we have performed the odd\even test, which consist in independent inversion of two data subsets. Comparison of the inversion results demonstrates good correlation for both the P and S models, and demonstrates that the result is rather robust and is almost unaffected by random factors. For investigating the resolution of Vp and Vs anomalies, we have performed horizontal and vertical checkerboard tests. For real and synthetic data, we have estimated the best reference models. We considered a few different starting models and estimated their effect upon the inversion results. The reliability of the results is also supported by comparison with the existing local, regional and global models created by other authors. Analysis of both models allows us to image the complex shape of the subducted slab beneath Alaska. We also observe a link between processes on the slab with volcanic activity in the study region.