SEISMIC DATA ABOUT 3D VELOCITY STRUCTURE OF THE SIBERIA UPPER MANTLE

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At 1960-80 in Siberia peace nuclear explosions along the super long DSS profiles with various directions were performed. Along these profiles 2D seismic models of the upper mantle were published in many articles [Egorkin et al., 1987; Egorkin, 2004; Mechie et al., 1993; Morozov, et al., 1999; Morozova et al., 1997, Nielsen et al., 1999; Pavlenkova, 1996, Pavlenkova et al., 2002; Pavlenkova & Pavlenkova, 2006, 2008; Priestly et al., 1994; Thybo, 2006 and others]. The same explosions were registered by a network of the seismological stations located in Altai-Sayan folded belt. We decided to compile 3D velocity structure of the upper mantle not from interpolation of 2D models [Pavlenkova & Pavlenkova, 2006], but at using profiles and seismological observations from these explosions data.

Data of Altay-Sayan seismological network (12 stations) from 57 shots located in Siberia [Sultanov et al., 1999] at offsets of 200-3500 km were digitized. Analog seismograms have been presented by Altai-Sayan division of the Siberian Branch Geophysical Survey of the Russian Academy of Science. The record sections show complicate and contrast changing of the first arrival times for waves which propagated along different directions in the upper mantle beneath the West Siberian, North Kazakhstan plates and Siberian platform.

To begin drawing up 3D model for forward ray tracing it needs to compile starting one, but using the published 2D upper mantle models not quite are approached for that. They contain rather thin and not everywhere tracked the low velocity layers which cannot be found because of insufficiently dense seismological observations. Moreover, existing models mutually significantly differ, most likely, because of non-uniqueness of the inverse problem and distinctions in model parameterizations. It indicates necessity to compile the simplest starting models along profiles with the largest features, which can be localized by means of the seismological data.

As an example we show the first results of 2D ray tracing along Rift profile (crosses Siberian platform) in length about 2600 km, executed directly in the spherical model of observation surface and seismic boundaries (program RAY84PC made H.Thybo and J.Luetgert was used). Our model also has appeared distinct from published ones.

It is revealed, that velocity anomalies from 8.0 up to 8.5 km/s with the cross-section sizes more than 200 km are traced only down to depths of 200 km. They are correlated with large structures of the Siberia platform basement. Below, down to depth of 410 km, data are fragmentary and it is possible to assume only, that the interval of 200-410 km depths is practically homogeneous at weak velocity increase with depth from 8.5 up to 8.55 km/s.

We are going to compile 3D upper mantle velocity structure at forward 3D ray tracing for refracted and overcritical reflection P-waves in offsets of 200-3500 km in heterogeneity model.

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