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Present-day structure of the lithosphere in Southern Siberia and surrounding areas from seismic tomography, gravity and morphotectonics

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We present the model of the lithosphere and upper mantle structure beneath central Asia based on results of seismic tomography, gravity and morphotectonics. In this study we estimate the role of mantle processes upon the crustal tectonics in the study area. Cenozoic deformations in the study region are associated by most authors with collision of the Indian and Asian continents. We present a new block structure of the crust of the study region which consists of discrete segments subdivided with active fault zones having various deformation regimes: compression, extension, rotation, and shear deformations. This model combines the information of several fragmentary maps and is more detailed than most of existing regional models. 3D seismic structure of the upper mantle beneath the region of interest is computed based on the regional tomographic code using the data from the worldwide ISC catalogue. All available travel times of P and PP rays which pass through the study volume were used in this study. This model was used for estimates of the lithosphere thickness in the study area. Beneath Northern Mongolia and Eastern Sayan we observe intensive low-velocity anomaly which corresponds to the areas of Cenozoic volcanism. To the north, this anomaly surrounds high velocity Siberian craton. At greater depths it tends to be shifted toward the interior part of southern segment of the craton. The derived seismic anomalies were compared with the observed gravity field and used to estimate the ratio of density / seismic velocity in different parts of the study area. We observe very good correlation of seismic patterns with long wavelength Bouguer gravity anomalies in Southern Siberia and Mongolia that presumes dominant temperature nature of these anomalies. In Northern Siberia this relationship is less clear. Based on combination of our geophysical findings (tomography and gravity models) with other available information, such as high-resolution relief, geology, geomorphology, satelite pictures, hydrology etc, we have created a map of block structure in the study region.