Geophysical Research Abstracts,
Vol. 11, EGU2009-3761-1, 2009
EGU General Assembly 2009

Anomalies of free mantle surface for Asia region as an indicator of subcrustal density inhomogeneities

V.N. Senachin (1) and A.A. Baranov (2)

(1) Institute of Marine Geology and Geophysics, FEB RAS, Yuzhno-Sakhalinsk (geodyn@imgg.ru), (2) Schmidt Institute of Physics of the Earth, Russian Academy of Sciences, Moscow, Russian Federation (baranov@ifz.ru)

Free mantle surface (FMS) is one of the important characteristics of the isostatic state of the Earth. FMS shows the degree of uplifting of the crust about the normal level, which corresponds to the homogeneous upper mantle. The FMS anomaly study can provide important information about the different geodynamic processes that responsible for the density heterogeneities in the upper mantle and the changing isostatic state of the lithosphere. Investigations of the FMS (Artemjev et. al, 1986) revealed main dependencies for the depth of the FMS under the continents and oceans. For the continental lithosphere it was found that the FMS depth depends on the thickness of the crust. Subsequently, the same dependence was revealed for the oceanic lithosphere using CRUST 2.0 model for all Earth (Senachin, 2008). In this study we present the updated FMS anomaly map for the Central and Southern Asia calculated using the crustal model AsCRUST-08 (Baranov, 2008), which has the resolution of 1x1 degree. We used the Moho map and density for upper, middle, and lower layers of crystalline crust for calculating the FSM anomalies.

The Southern and Central Asia is tectonically complex region characterized by the great collision between the Asian and Indian plates, anomalously thick uplifted crust, and the large extensional zones near the southern and eastern margins of Asia. The evolution of the entire region is also strongly related to the active subduction along the Pacific border. The crustal model AsCRUST-08 provides substantially more detailed FMS data for the Asia region. We can see anomalous uplifting of the FMS up to 3 km in the extensional zones (Red Sea) and in the deep seafloor areas. Arabian Peninsula has the FMS depth about 6 km, which can be attributed to rather high density of the upper mantle. For Tibet region we reveal quite complex dependence between the FMS depth and the thickness of the crust. The central part with crustal thickness more then 45 km has elevated FMS level. Contrary, the northern Tibet margin is characterized by the deeper FMS. The same result is obtained for the Andean region using CRUST 2.0 data. We assume on the base of received data that density of subcrustal mantle on the depth more then 45 km is bigger then density which was used in calculations of FMS (3.3 g/cm3). Thus, the density of subcrustal mantle of Tibet region by AsCRUST-08 data is evaluated of 3.38 g/cm3.

[1] Senachin V.N. The isostasy and density inhomogeneous of the lithosphere on the data of Crust 2.0 model// Relationship between the surface and deep structures of the earth's crust: Proceedings of the 14th International Conference. Petrozavodsk: Karelian Research Centre, RAS. Part. 2. - 2008. - P. 186-188 (in Russian).
[2] Bassin C. et al. The Current Limits of Resolution for Surface Wave Tomography in North America, // EOS Trans AGU. 2000. 81(48), Fall Meet. Suppl., Abstract F897. (http://mahi.ucsd.edu/Gabi/rem.html)
[3] Baranov A. A. et al. First steps towards a new crustal model of South and Central Asia, Geophysical Research Abstracts, Vol. 10, EGU2008-A-05313, 2008, http://meetings.copernicus.org/egu2008/.
[4] Artemjev M. E. et al. The free mantle surface - new possibilities to reveal subcrustal inhomogeneities from the structure of the earth's crust //Journal of Geodynamics - 1986. - Volume 5, Issue 1, p. 25-44.