



Observing the Ukrainian territories and the East European Platform's adjacent regions with the gravimetric tomography modelling

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The gravimetric tomography technology is based on applying of the gravitational potential (geoid) data. Spherical harmonics coefficients are used to calculate the harmonic density anomalies by the Prof. H Moritz's program (1) and to determine a depth of disturbing layer also. 3D sections along the characteristic patterns and lateral slices for different depths are the result of modeling.

The condition of isostasy requires that the harmonic density anomalies (computed with the inverse gravimetric problem) have to be compensated in a number of cases. Observed geoid height anomalies are directly proportional to the dipole moment of density distribution in accordance with the work (2). The dipole in our case is a distribution of harmonic density anomalies beneath the each of point measured along the section. Our gravimetric tomography models after procedure of the isostatic compensation are coordinated with the available seismic tomography models.

Gravimetric tomography models are informative data to study features of the structure and geodynamics of the East European Platform. Nowadays observed EGM 96 and EGM2008 geoid models allow to display the Earth's interior on the global scale with a suitable spatial resolution.

So, several sections and maps of density inhomogeneities distribution are shown in the report. Tomographic models along meridians of 26 [U+F0B0]E, 30 [U+F0B0]E, 31 [U+F0B0]E, 34 [U+F0B0]E and along sublatitude sections are calculated. They extend from the Mediterranean Sea up to the high north latitudes and show a deep structure up to the depth of 5300 km and interaction between layers for different blocks of the European Plate. The root part of the Plate is noted in depth of 55 km. South and North sides of the Plate are inclined inward due to opposite trends of the subduction effects of the eastern Mediterranean (3) and in the region of Kola Peninsula. The density compensation of the geoid anomalies shows a lower density for the Anatolia Mountains than the quasi oceanic crust of the Black Sea floor.

Validity test of the tomographic images was carried out using geological, geophysical and seismic atlases on Ukraine and the Black Sea geoid with the ERS1 satellite altimeter observations. The positive Bouguer gravity anomalies are observed in regions of the Ukrainian Shield, the Black Sea littoral depression, the Crimea Mountains, and the negative anomalies are in regions of the Carpathians Mountains, Voronezh massif and Indolo-Kuban depression.

Results of comparison between gravimetric and seismic tomographic models along meridional and latitudinal sections are shown.

The EGM2008 geoid model shows more detail density distribution than the EGM96 geoid for the Ukrainian territory.

1. Moritz H. 1990. The Figure of the Earth. Theoretical Geodesy and the Earth's Interior. Wichmann, Karlsruhe; 2. Turcotte, D. L. & Schubert, G. 2002. Geodynamics, 2nd ed. Pp. 456; 3. Wortel M. J. R., Spakman W. Subduction and Slab Detachment in the Mediterranean-Carpathian Region. Science 8 December 2000: Vol. 290. no. 5498, pp. 1910 – 1917, DOI: 10.1126/science.290.5498.1910.