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Gravity Model of the Lithosphere of Taiwan

GULSHAT ZABIROVNA GILMANOVA[1],
VLADIMIR YAKOVLEVICH PODGORNY[2]

[1] *Pacific Oceanological Institute, 43, Baltiiskaya Street, Vladivostok 690068, Russia*

[2] *Yu. A. Kosygin Institute of Tectonics and Geophysics, 65, Kim Yu Chen Street, Khabarovsk, 680000, Russia*

Taiwan is located in the Asian and Philippine lithospheric plates interaction area being the constituent of the tectonic collision structure originated due to effect of the convergence processes. The attempt has been made as to the study of deep structure of the lithosphere in the area by using the layer-by-layer gravity modeling. Based on the data published the synthetic section of the lithosphere has been constructed, as the initial model, along NW-SE line crossing the Taiwan Strait, the southern part of the island, the Huatang Basin and the adjacent part of the West-Philippine Basin (WPB). From the results of the obtained density distribution a steeply-dipping structure of about 260 km width is distinguished which is traced through the entire thickness of the lithosphere. The pattern of the structure is inhomogeneous, being mainly characterized by the increased density and corresponding to the lithosphere of Taiwan and the coastal part of the Huatang Basin. Its outer bounds are determined from correlation of the density contrast within the mantle of the lithosphere and in the crustal layers. The structure distinguished consists of three zones differing as to the shape and inner structure and reflecting its evolution and geodynamic regimes of development. In the upper part, the central zone which is the core of the structure is represented by the crust of the mountainous part of the island and its eastern coastal slope. Within the crust it acquires the slope to the east. Probably, this reflects the more intense mobility of the mantle of the lithosphere and its westward movement relative to the crust. By indirection, an increase in the density of the subcrustal part of the zone from east to west in the range from 3.34 to 3.41 g/cm3 and asymmetry in the pattern of the entire gravitational structure testify to this. The asymmetry is manifested here by visibility of displacement of the body of the central zone to the west and compression (contraction) of the western zone to 50 km. As a result, the western zone is funnel-shaped and has an expansion in the crust to 100 km. It encloses the crust of the Western foothills and the Coastal Plane of Taiwan, built up of the contrasting density inhomogeneities. The eastern boundary of the lithospheric density structure of Taiwan within the crust is shaped as a broken zigzagging line and emphasizes an echelon-like (imbricated) superposition of the lower and middle crustal layers of the Huatang Basin on the lithospheric mantle and the crust of the eastern zone from the east. Within the central part of the structure under study it is distinguished a narrow (15-30 km width) subvertical strip correlative with the low density. It is traced through the entire thickness of the lithosphere and corresponds to the location of the Longitudinal Valley Fault, reflecting, probably, its deep structure. According to the modern concept this fault is the boundary structure between the continental and oceanic lithospheres. The emphasized peculiarities as to the deep gravity structure are in consistency with the earthquake hypocenter data. Key words: collision zone of Taiwan, gravity model of the lithosphere.