Three Dimensional Crustal Density Structure of Central Asia and its Geological Implications

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A b s t r a c t s

This paper introduces the scale-depth law of multi-scale wavelet analysis for regional gravity data processing, and presents the results of its application to Central Asia for computation of the 3D crustal density structures. The wavelet analysis method is applied for characterizing 3D crustal density structure, producing five maps of density disturbance corresponding to different depths of equivalent layers in the crust. The results provide important evidence for the study of crustal structures and mass movement in Central Asia: (i) the small-scale and intensive linear density disturbances in the upper crust indicate Phanerozoic orogenic belts; (ii) there exists a horseshoe-shaped low-density belt in the middle crust coinciding with the Kazakhstan orocline; (iii) there is a very low density zone in the lower crust, extending from western Kunlun to Tianshan, probably indicating a lower-crust flow; (iv) there are a few low-density spots in the middle crust, which might be caused by low-density mass squeezing upward from the lower crust flows.

Key words: Central Asia, multi-scale wavelet analysis, density disturbance, lower-crust flows, orocline.