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Deep Crustal Structure Constrained by Geophysical Data in the Eastern Part of Junggar Basin

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Xinjiang, located in the hinterland of the Asian continent, is a key area for the production of petroleum, coal, and metal ores, which preserves a lot of important information of the formation and evolution of the Asian continent. As a part of Xinjiang, the formation and evolution of the crust of the eastern part of the Junggar basin is closely relevant to that of the Xinjiang, meanwhile, it is integral intrinsic link with the tectonic framework of the Asian continent and its the changes of the dynamic system. In order to study the deep crustal structure of the eastern part of the Junggar basin, the authors calculated the isostatic gravity anomaly based on the ground actual measurement data of Bouguer gravity anomaly, and then resolved the Bouguer gravity anomaly, the isostatic gravity anomaly, and the magnetic anomaly by reduction to the pole using the wavelet transform method, and obtained multi-order wavelet transform approximation of gravity and magnetic anomalies. Combined with the existing research results of the deep seismic sounding and the magnetotelluric deep sounding, this paper analyses the features of the Bouguer gravity anomaly, the isostatic gravity anomaly, the magnetic anomaly by reduction to the pole, and the multi-order wavelet transform approximation of gravity and magnetic anomalies, discusses deep geological significance of these gravity and magnetic anomalies, studies the deep crustal structure of this area. The results showed that the upper mantle uplifted in the Junggar basin, and the thickness of the lower crust was thinner than that of the eastern Junggar orogenic belt and the western Tianshan orogenic belt, and the thickness of the middle crust and the upper crust changed larger. The study revealed that the Junggar basin turned down under the eastern Junggar orogenic belt and the western Tianshan orogenic belt, and the fault in the northern margin of the Junggar basin with larger scale may cut the top surface of the upper mantle, causing the mantle substances to upwelling to the middle crust with larger density, stronger magnetic property, and larger resistivity. The crustal subsidence depth of the northern Tianshan orogenic belt was relatively small, so that the compensation of the deep crustal substances was a serious shortage. The thickness of the middle crust and the upper crust changed larger in the eastern Junggar orogenic belt and the western Tianshan orogenic belt.

Key words: the eastern part of the Junggar basin, gravity and magnetic field, deep seismic sounding, magnetotelluric deep sounding, deep crustal structure

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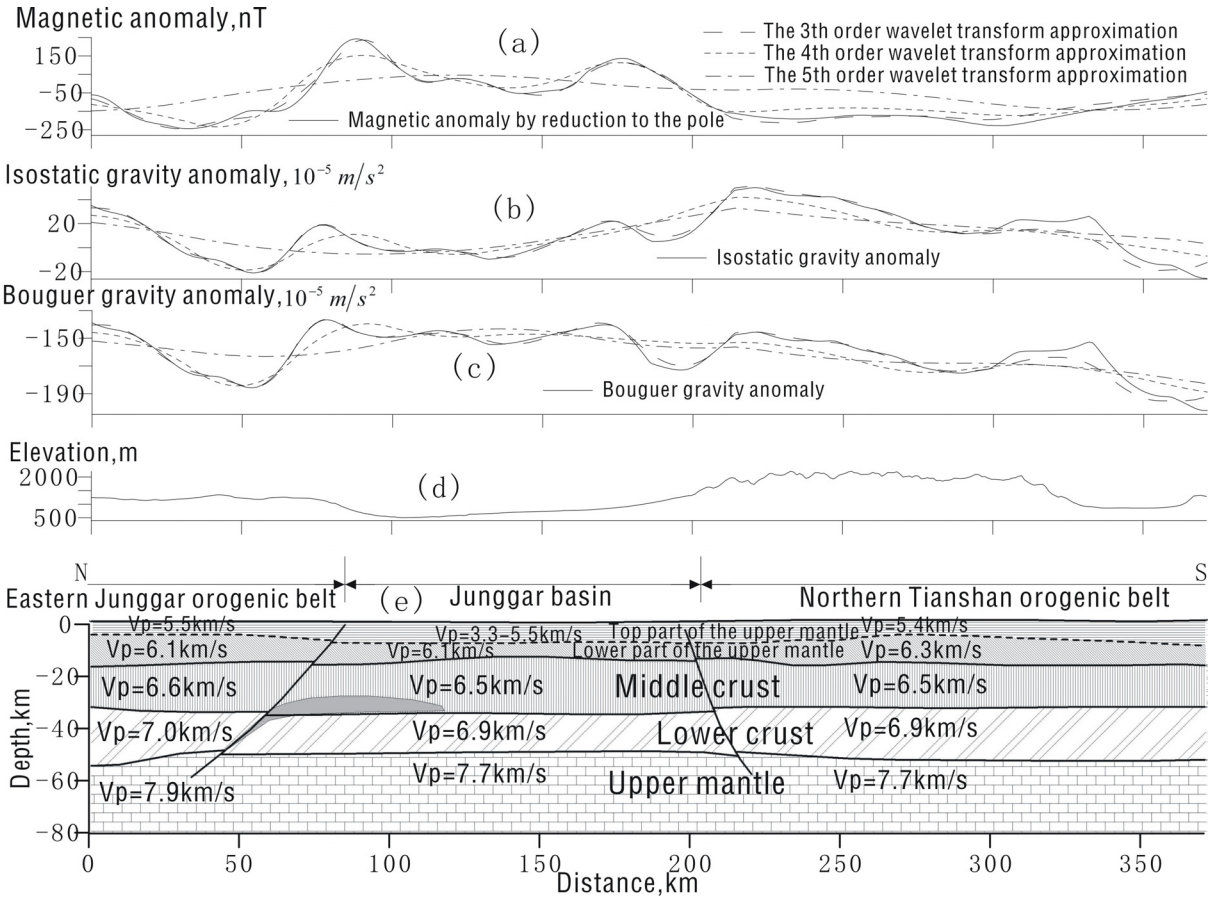

Fig. 1. The integrated interpretation map.

(a) The profile of the magnetic anomaly by reduction to the pole and the multi-order wavelet transform approximation; (b) The profile of the isostatic gravity anomaly and the multi-order wavelet transform approximation; (c) The profile of the Bouguer gravity anomaly and the multi-order wavelet transform approximation; (d) The elevation profile; (e) The crustal and velocity structure (modified after Wang Youxue et al., 2004).