



The deep crust structure of Bohai Sea from gravity and magnetic study

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The Bohai Sea is one part of the North China Craton (NCC), and its deep structure is very important to understand the tectonic evolution of NCC from the land to the sea. In the sea area, the seismic exploration has given the detail sedimentary structure, but the deep structure has not been learned clearly. The tomography results approximately gave the regional background about the upper mantle. To study the deep crust structure of the Bohai Sea, we select one profile to invert the density and magnetic susceptibility structure using Bouguer gravity and aeromagnetic data. The profile is from Zhuozhou, Hebei province to the Bohai Sea along NWW direction, and the total length is 420km (~220km in the sea area). The main tectonic units across the profile include Baxian sag, Cangxian Uplift, Banqiao Sag, Qikou Sag, Shaleitian Uplift and Bozhong Sag.

The initial shallow structure model (sedimentary layer) of the profile is established from the seismic exploration results. The initial deep structure model, including the Moho depth and middle crust layer, is based on the gravity and magnetic study results of Bohaiwan Basin. The density and magnetic susceptibility parameters are given by the statistical results of the former measurements in this area. The average density of the Quaternary-Neozoic, Eogene, Mesozoic-upper Palaeozoic, is $2.20 \times 103 \text{kg/m}^3$, $2.40 \times 103 \text{kg/m}^3$, $2.48 \times 103 \text{kg/m}^3$, respectively. The average density of the older stratum below is selected as $2.69 \times 103 \text{kg/m}^3 \sim 2.85 \times 103 \text{kg/m}^3$ and the density contrast of the crust and upper mantle is about $0.32 \times 103 \text{kg/m}^3$. The magnetic layer in this region mainly is the lower-paleozoic to middle-proterozoic layer except some local igneous rocks in sedimentary basin. To study the deep structure, we mainly consider the magnetic effects from deep magnetic layer. The magnetization intensity of the lower-paleozoic to middle-proterozoic layer are set $0.25 \sim 0.45 \text{ A/m}$.

The gravity and magnetic anomaly are inverted by adjusting the structure and density/magnetic parameter and fitting the anomaly effects of models and the original anomaly data. The inversion results give the main character of the crust structure of this area. The Moho depth is average 32km at land area and 29km at sea area. It has thinned about 3km from land to sea. The Moho is not uplift much below the Bozhong Sag. Form the comparison of the inversion results of the land and the sea, we deduce there is no obvious mantle uplift in Bohai sea, and the thick sedimentary layer of Bohai Sag may be supported by the middle-upper crust with higher density.