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渤海湾地区壳幔结构重磁综合研究

徐亚[1,2], 郝天珧[1,2], 黄松[1,2], 李志伟[1,3], 吕川川[1,2], 赵百民[1,4], 胡卫剑[1,2]*

1. 中国科学院油气资源研究重点实验室,北京 100029;
2. 中国科学院地质与地球物理研究所,北京 100029;
3. 中国科学院大地测量与地球物理研究所,武汉 430077;
4. 国土资源部航空物探遥感中心,北京 100083

Crustal and mantle structure of the Bohai bay area based on the gravity and magnetic data

XU Ya[1,2], HAO Tian-Yao[1,2], HUNG Song[1,2], LI Zhi-Wei[1,3], LV Chuan-Chuan[1,2], ZHAO Bai-Min[1,4], HU Wei-Jian[1,2]*

1. Key Laboratory of Petroleum Resource Research, Chinese Academy of Sciences, Beijing 100029, China;
2. Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China;
3. Institute of Geodesy and Geophysics, Chinese Academy of Sciences, Wuhan 430077, China;
4. China Aero Geophysical Survey & Remote Sensing Center for Land and Resources, Beijing 100083, China

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摘要 渤海湾盆地是华北克拉通破坏的中心,其东部渤海海域深部结构研究对认识华北克拉通破坏范围及动力学过程具有重要意义.为此,本文选取自河北新城经天津静海沿东南方向进入渤海海域的剖面进行重磁反演,研究其地壳结构特征.通过对该地区文献调研及2010年渤海海陆联测初步结果建立初始模型,结合本地区密度、磁化率特征进行二度半体重磁异常反演,获得了该剖面地壳结构及其物性分布.反演结果表明莫霍面自陆地向海域逐渐抬升,海域莫霍面较浅,且有局部隆起(沙垒田隆起部位),幅度约2 km.莫霍面总体变化特征与华北克拉通地区岩石圈向东部减薄总体类似,表明中生代以来华北克拉通破坏对岩石圈及莫霍面结构的影响具有一致性.通过深部隆起模型重力异常模拟实验表明,渤海海域存在地幔柱或大规模隆起的可能性较小,莫霍面微隆可能与上地幔局部小规模异常体有关.

关键词: 渤海 重力异常 磁异常 地壳结构 华北克拉通

Abstract: Bohai bay basin is the center area of the destruction of North China Craton (NCC). The deep structure study of the Bohai Sea plays a key role in understanding the scope and dynamic process of the destruction of NCC. In this paper, we studied the crustal structure of the profile from Xincheng, Jinghai, to Bohai sea along the southeast direction based on the gravity and magnetic data. The initial model was build based on the former studies about the sedimentary structure, deep crustal structure and the onshore-offshore seismic survey in 2010. Combined with the density and magnetic susceptibility parameters in this area, the crustal structure and the physical parameter distribution were inverted using 2.5D gravity and magnetic inversion method. The integrated study indicates that the Moho becomes shallower from the land to the sea. The Moho of the Bohai sea is shallower, and rises locally in Shaleitian area with about 2 km uplift. The variation of the Moho is similar with the lithosphere thinning in the eastern NCC. It reflects that lithosphere and deep crustal structure were similarly affected by the destruction of the NCC from Mesozoic. We do the deep uplifting modeling to test the gravity effects from the mantle uplifting. Combined with the analysis of the gravity of the profile, it is less likely to have mantle plume or large mantle uplifting in the Bohai sea, the local small uplifting of the Moho in Bohai sea is likely related with a small anomaly body in the upper mantle.

Keywords: Bohai Sea Gravity anomaly Magnetic anomaly Crustal structure North China Craton

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About author: 徐 亚,男,1980年生,副研究员,主要从事重磁勘探方法、海洋地球物理综合研究.E-

mail:xuya@mail.iggcas.ac.cn

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