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危自根[1,2], 陈凌[1], 杨小林[3]*

1. 中国科学院地质与地球物理研究所岩石圈演化国家重点实验室,北京 100029;
2. 中国科学院研究生院地球科学学院,北京 100049;
3. 陕西省地震局,西安 710068

Transverse variations of crustal thickness and V_P/V_S ratio under the stations in the Liaodong anteclise-Yanshan belt-Xingmeng orogenic belt and their tectonic implications

WEI Zi-Gen[1,2], CHEN Ling[1], YANG Xiao-Lin[3]*

1. State Key Laboratory of Lithospheric Evolution, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China;
2. College of Earth Science, Graduate University of Chinese Academy of Sciences, Beijing 100049, China;
3. Shaanxi Earthquake Adiministration, Xi'an 710068, China

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摘要 本文研究采用接收函数*H-κ*方法获得了辽东台隆、燕山带和兴蒙造山带台站下方的地壳厚度和平均波速比(V_P/V_S).结果显示,研究区域三个构造区地壳平均厚度略有差别,分别为32、33 km和35 km,但横向变化特征各异.辽东台隆地壳中间厚两端薄,燕山带地壳厚度的变化相对平缓,而在兴蒙造山带内,以索伦缝合带为界地壳呈由东南向西北增厚趋势,并在缝合带附近变化迅速.V_P/V_S比值在整个研究地区也表现出显著波动,特别是在燕山带波速比横向变化明显,在靠近兴蒙造山带的边界附近(大致对应于南北重力梯度带位置)明显增高;而在兴蒙造山带波速比则相对偏低,且横向变化较小.燕山带与兴蒙造山带地壳结构特征的差异表明,燕山带在中-新生代可能经历了更为强烈的后期改造.南北重力梯度带附近地壳结构的明显改变,并结合前人观测到的该处岩石圈深部结构的强烈横向变化,表明重力梯度带可能是一条岩石圈尺度的大型陆内构造边界带,其两侧地区可能经历了不同的显生宙岩石圈演化过程.兴蒙造山带(索伦缝合带附近)以及辽东台隆地壳厚度的变化与地形相对应,而其波速比值也相对稳定,这可能反映了两个区域各自受到的地壳改造横向差异性相对较小,结构和成分相对均匀.

关键词: 辽东台隆 燕山带 兴蒙造山带 地壳厚度 波速比

Abstract: We obtained the crustal thickness and average crustal V_P/V_S ratio along the profiles across the Liaodong anteclise, Yanshan belt and Xingmeng orogenic belt using *H-κ* stacking of receiver functions. The result shows that the average crustal thicknesses of these three tectonic units are 32, 33 and 35km, respectively, indicative of slight differences, and display distinct transverse variations in the crustal structure. The crust is thicker in the middle and thinner on each side in the Liaodong anteclise, whereas the thickness of the crust varies smoothly in the Yanshan belt. In the Xingmeng orogenic belt, the crust thickens sharply from southeast to northwest near the Solonker suture. The V_P/V_S ratio also fluctuates obviously in the study region. In particular, it varies laterally in the Yanshan belt and increases markedly nearby the boundary area between the Yanshan belt and the Xingmeng orogenic belt (near the north-south gravity lineament (NSGL)). However, the V_P/V_S ratio is relatively low and has no much change in the Xingmeng orogenic belt. The distinct crustal structures between the Yanshan belt and the Xingmeng orogenic belt are probably indicative of a more intense crustal modification in the Yanshan belt compared with the Xingmeng orogenic belt during Mesozoic-Cenozoic time. Significant changes in the crustal structure roughly coincide with the NSGL. This together with the concordant change in the deep lithospheric structure observed previously suggests that the NSGL may be a lithospheric-scale intra-continental tectonic boundary, the opposite sides of which may have evolved differently in the Phanerozoic. The thickening of the crust in the Xingmeng orogenic belt (near the Solonker suture) and the Liaodong anteclise appears to mirror the surface topography, and corresponds to relatively stable V_P/V_S ratios. This feature probably indicates relatively even Phanerozoic modifications of the crust in each region, resulting in minor lateral variations in the crustal structure and components at the present time.

Keywords: Liaodong upwarp Yanshan belt Xingmeng orogenic belt Crustal thickness V_P/V_S ratio

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About author: 危自根,男,1984年生,博士生,主要从事壳幔结构研究.E-mail: weizigen@mail.iggcas.ac.cn