地球物理学报 » 2011, Vol. 54 » Issue (1) :67-76

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潘佳铁, 吴庆举, 李永华, 张风雪, 张广成.华北地区瑞雷面波相速度层析成像[J] 地球物理学报, 2011,V54(1): 67-76,DOI: 10.3969/j.issn.0001-5733.2011.01.008

PAN Jia-Tie, WU Qing-Ju, LI Yong-Hua, ZHANG Feng-Xue, ZHANG Guang-Cheng.Rayleigh wave tomography of the phase velocity in North China.Chinese J.Geophys. (in Chinese),2011,V54(1): 67-76,DOI: 10.3969/j.issn.0001-5733.2011.01.008

华北地区瑞雷面波相速度层析成像

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Rayleigh wave tomography of the phase velocity in North China

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摘要 参考文献 相关文章

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摘要 利用华北科学探测台阵190个宽频带台站和8个甚宽带台站2006年10月至2009年5月记录的远震垂直向资料,用小波变换频时分析方法测定了1587条独立路径的基阶瑞雷波相速度频散曲线,并使用Ditmar & Yanovskaya 方法反演得到111°~120°E,37°~42°N区域内、周期10~60 s的高分辨率相速度分布图像.本文的研究结果表明,华北地区的地壳上地幔横波速度结构存在横向非均匀性.短周期(如10 s)的相速度分布与地表地质构造具有明显的相关性,随着周期的增大(如15 s),地形的控制作用相对减弱.中周期(如30 s)的相速度分布差异暗示华北克拉通中、东部地区下地壳具有不同的物质组成,图中相速度梯度带与太行山重力梯度带位置十分相近,说明该重力梯度带两侧的地壳速度结构差异较大.与短周期相比,研究区内长周期(如60 s)相速度分布的横向非均匀性明显减弱,表明研究区上地幔顶部速度结构差异较地壳的小.与全球典型大陆克拉通相比,华北克拉通10~60 s的相速度频散明显偏低,其频散特征与全球典型裂谷地区相类似,这暗示华北克拉通已经遭受了明显的侵蚀与破坏.

关键词: 瑞雷面波 相速度 层析成像 双台法 华北克拉通

Abstract: Using the teleseismic data recorded by 190 broadband stations and 8 very broadband stations of the portable seismic array in North China during Oct. 2006 to May. 2009, short period (10~60 s) inter-station phase dispersions of fundamental Rayleigh waves are obtained by the method of frequency and time analysis of wavelet transformation. A total of 1587 independent dispersion curves were then arranged into a tomographic inversion scheme to obtain the pure-path phase velocity dispersion at 0.5° by 0.5° grids in this region. It shows that the S-wave structure of the crust and upper mantle beneath North China is heterogeneous. The phase velocity distribution at period of 10 s is related with the geologic units on the surface,but the effect of topography becomes weaker in the longer periods(15 s). In the middle period part (30 s), the difference of phase velocity between the eastern NCC and central NCC reveals the difference of composition in the middle-lower crust. At the same time, the gradient zone of phase velocity is very close to the gravity gradient zone of the Taihangshan on the map of period 30 s, and it indicates that there are many differences in the crustal structures on the two sides of the gravity gradient zone. Compared with the phase velocity maps of short periods, the lateral heterogeneity of phase velocity becomes much weaker in the long period (60 s) maps. Compared with that in typical Craton, the phase velocity of NCC is much slower at periods of 10~60 s, whose dispersion characteristic is very similar with that in the typical rift regions of the world (e.g. Rio Grande Rift). It indicates the NCC has been obviously eroded and breached.

Keywords: Rayleigh wave Phase velocity Tomography Two station method North China

Received 2010-05-19;

Fund:

国家自然科学基金(90814013,40774039)和科技部科技基础性工作专项(2006FY110100)资助.

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