

引用本文(Citation):

王小龙, 马胜利, 郭志, 雷兴林, 夏英杰, 郭欣, 余国政, 勾宪斌, 蒋霞东. 利用地震背景噪声成像技术反演三峡库区及邻近地区地壳剪切波速度结构. 地球物理学报, 2013,56(12): 4113-4124,doi: 10.6038/cjg20131216

WANG Xiao-Long, MA Sheng-Li, GUO Zhi, LEI Xing-Lin, XIA Ying-Jie, GUO Xin, YU Guo-Zheng, GOU Xian-Bin, JIANG Xia-Dong. S-wave velocity of the crust in Three Gorges Reservoir and the adjacent region inverted from seismic ambient noise tomography. Chinese Journal Geophysics, 2013,56(12): 4113-4124,doi: 10.6038/cjg20131216

## 利用地震背景噪声成像技术反演三峡库区及邻近地区地壳剪切波速度结构

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### S-wave velocity of the crust in Three Gorges Reservoir and the adjacent region inverted from seismic ambient noise tomography

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摘要

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摘要 本文利用三峡库区重庆遥测台网及邻近地区台网2012年1月至12月期间的连续波形记录, 通过噪声互相关, 提取了这些台站间的经验格林函数. 并通过获取的经验格林函数瑞利面波频散信息, 反演出该区域5~40 s瑞利面波相速度分布. 周期5 s及10 s的相速度分布结果显示: 四川盆地具有较厚的沉积盖层, 其中盆地中部沉积层相对偏浅. 而周期20 s及35 s的相速度分布结果显示: 中下地壳的扬子克拉通整体呈现较高的相速度分布, 具有相对坚硬的中下地壳结构. 这其中吉首—常德的武陵山区附近出现明显高速异常, 可能与江南古陆古火山岛链(雪峰—九岭弧形古火山群)活动有关, 火山活动导致大量的基性-超基性幔源物质侵入地壳, 造成了武陵山重力异常, 并一定程度上阻挡了云贵高原和湘鄂西部的物质向南逃逸; 在地形上, 此处恰好对应我国地形第二阶梯向第三阶梯的过渡带, 并将华南地块分隔为东西两大部分. 最后我们在瑞利面波相速度成像的基础上, 反演出该区域三维剪切波速度分布, 结果显示四川盆地周边的龙门山、米仓山、大巴山、七曜山和大娄山等地质构造与地壳剪切波速度结构具有明显对应关系. 研究结果有助于深入研究该区的深部地质构造特征与地震发生机理.

关键词 背景噪声成像, 瑞利面波, 相速度, 剪切波速度结构, 三峡库区

Abstract: We investigate the crustal velocity structure of the Sichuan basin based on ambient noise tomography using continuous waveform data recorded by the Chongqing telemetry network and other permanent stations in the region from January to December of 2012. By extracting the dispersion information of Rayleigh waves from empirical Green functions (EGFs), we invert the phase velocity of surface waves for periods from 5 s to 40 s and further estimate S-wave velocity in 3-dimensions. The results of phase velocity at periods of 5 s and 10 s indicate that the Sichuan basin is characterized by thick sedimentary layers, of which the thickness is relatively small in the central basin. The phase velocity at periods around 20 s mainly reflects the S-wave velocity structure in middle crust, which demonstrates increasing velocity with increasing depth. The phase velocity at the period about 35 s is totally high indicating that the Yangtze plate has a rigid lower crust in the region. Particularly, the distinct high velocity anomalies around the Wuling Mountains from Jishou to Changde are most likely related to the paleo-volcanic chain of Jiangnan paleo-continent activity which caused a large amount of basic and ultrabasic mantle material intruded into the crust. With greater mechanical strength, it plays a certain impediment to southward escaping of material on the west of the Wuling Mountains gradient zone of gravity anomalies (Yunnan-Guizhou Plateau and the mountainous topography of the west of Hubei and Hunan), which is just located in the transition zone of the second step and the third step of China's topography. The obtained 3-dimensions S-wave velocity model is corresponding to the main geological structures within and surrounding the Sichuan basin, and

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thus it is meaningful for further study on the deep structure and seismicity in the region.

Keywords [Ambient noise tomography](#), [Rayleigh wave](#), [Phase velocity](#), [Shear wave velocity structure](#), [Three Gorges Reservoir](#)

Received 2013-05-25;

Fund: 中国地震局地震科技星火计划项目 (XH14042)、地震动力学国家重点实验室开放课题 (LED 2011B06) 共同资助.

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