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龙门山断裂带精细速度结构的双差层析成像研究

邓文泽, 陈九辉, 郭飏, 刘启元, 李顺成, 李昱, 尹昕忠, 齐少华*

中国地震局地质研究所地震动力学国家重点实验室, 北京 100029

Fine velocity structure of the Longmenshan fault zone by double-difference tomography

DENG Wen-Ze, CHEN Jiu-Hui, GUO Biao, LIU Qi-Yuan, LI Shun-Cheng, LI Yu, YIN Xin-Zhong, QI Shao-Hua*

State Key Laboratory of Earthquake Dynamic, Institute of Geology, China Earthquake Administration, Beijing 100029, China

摘要

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摘要

利用川西流动地震台阵、汶川地震震后应急台网记录到的P波到时资料, 对2008年5月至2008年10月期间发生的汶川地震余震序列应用双差层析成像方法进行了地震震源和三维P波速度结构的联合反演. 结果显示, 联合反演获得的地震重定位结果与基于一维地壳参考模型的双差定位方法结果相近; 研究区15 km以上速度结构与地表断裂分布密切相关, 20 km以下深度呈现北东向和北西向交错结构. 汶川地震破裂带南段龙门山断裂带之间上地壳呈现高速异常, 速度结构的非均匀变化是控制余震分布和主震破裂传播的主要因素; 联合反演结果给出了小鱼洞—理县方向存在隐伏断裂的速度结构证据, 同时发现, 破裂带北东段可能沿新发断裂扩展; 结果确认了汶川地震起始段的高角度逆冲断裂特征, 也确认了前山断裂和中央断裂在约20 km深度合并到脆韧转换带的特征.

关键词 汶川地震, 龙门山断裂带, 川西台阵, 双差层析成像

Abstract:

Using P-wave travel time data recorded by the Western Sichuan movable seismic array and the earthquake emergency response stations during May 2008 to October 2008, we obtained accurate relocation of Wenchuan earthquake sequence and 3D P-wave seismic velocity structure by double-difference tomography. The results show that aftershock relocation by joint-inversion is similar to that based on 1-D velocity model by double-difference relocation; the P-wave velocity of Longmenshan fault zone region in 0~15 km is closely correlated with local geology, and the region in 20~30 km shows NE-NW cross structure. The south segment of Longmenshan fault zone is imaged as high P-wave velocity region in upper crust, the structure heterogeneity controls the distribution of aftershocks and the direction of propagation. The joint-inversion result also proves the existence of Xiaoyudong-Lixian buried fault, we also found that the NE segment of rupture zone may extend in new fault. The results confirm the Wenchuan earthquake as a high-angle listric thrust, and also confirm that the Yingxiu-Beichuan fault and Guanxian-Jiangyou fault merge into a shear belt at the depth of 20 km.

Keywords [Wenchuan earthquake](#), [Longmenshan fault zone](#), [Western Sichuan seismic array](#), [Double difference tomography](#)

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