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玉树 M_S 7.1级地震部分余震重新定位及发震构造分析

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Relocation of Yushu M_S 7.1 earthquake aftershocks and discussion on seismogenic structure

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摘要

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摘要 综合利用玉树震区应急流动台站观测数据和青海地震台网固定台站观测数据,依据最新的人工地震宽角反射/折射剖面的速度模型,采用Hypo2000地震定位法,对2010年4月18日至4月29日期间玉树震区发生的部分余震进行了重新定位.重新定位后,震源位置的水平和垂直方向平均误差分别为1.35 km和4.68 km,走时残差为0.49 s.震源深度分布范围为1.48~19.85 km,平均震源深度为10.28 km.定位研究表明:玉树地震余震沿北西-南东向的甘孜-玉树断裂带的北支,即玉树-隆宝断裂分布,长约97 km.余震分布特征在主震(微观震中)两侧存在差异,可能反映了两侧构造特征存在差异.截止到4月29日,主震东南仍是应力的主要释放区域,余震强度大且活动密集的区域位于主震东南距主震约5 km、横向范围约20 km.主震破裂区的大部分应力在主震过程中得以释放,主震时应力未释放的区域成为主要的余震分布区.余震的连续发生可能已造成主震破裂区相互连通,且破裂范围向西北方向扩展.玉树主震及余震的发震构造为甘孜-玉树断裂的北支,即玉树-隆宝断裂段,断层性质为北东倾向的高角度左旋走滑断层.发震断层的倾角和宽度在帮洞两侧有所不同,帮洞以东发震断层宽度约为12 km,倾角约为83°;而帮洞以西发震断层宽度约为6.5 km,断层倾角约减缓为63°.

关键词 玉树 M_S 7.1地震余震, Hypo2000地震定位法, 重新定位, 余震空间分布特征, 发震构造

Abstract: Using the data recorded by both movable and fixed digital seismic monitoring networks in Qinghai province as well as the latest crustal velocity model determined with seismic wide angle reflection/refraction profile, a part of the Yushu earthquake aftershocks occurred from April 18 to 29, 2010, were relocated accurately by means of Hypoinverse-2000 location algorithm. After relocation, the vertical and horizontal average errors are 1.35 km and 4.68 km, respectively and the root-mean-square residual error of the travel time is 0.49s. The focal depth range is 1.48~19.85 km, and the average focal depth is 10.28 km. The results show that the Yushu earthquake aftershocks are mostly distributed along the northern segment of NW-SE trending Garzê-Yushu fault zone, i.e. Yushu-Longbao fault with a length about 97 km. On the two sides of the principal earthquake (micro epicenter), the aftershock distribution presents different characteristics, which may suggest the different structural features. The densest aftershock area with higher strength, which is about 5 km from the main shock and its range is about 20 km, lay on the southeast of the main shock. Until April 29, the southeast of the main shock is still the major area of stress release. During the occurrence of main shock, much of the stress of the main shock rupture zone is released and the regions where the stress is not released became the major areas with aftershocks taking place. Continuous occurrence of aftershocks may have led to the main shock rupture zone connected to each other, and the rupture extended toward the northwest. The seismogenic fault of Yushu main shock and aftershocks is the northern branch of Garzê-Yushu fault zone, i.e. Yushu-Longbao fault, which dips to northeast with high-angle left-lateral strike-slip. The seismogenic fault dip angle and the fault width are different on the two sides of Bangdong. On the east of Bangdong, the dip angle and the fault width are about 83 degree and 12 km respectively while on its west, the fault width is about 6.5 km and the dip angle descends to 60 degree.

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