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2010年玉树地震地表破裂带典型破裂样式及其构造意义

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Surface rupture features of the 2010 Yushu earthquake and its tectonic implication

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摘要

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摘要 野外调查表明,青海玉树 $M_S7.1$ 地震发生在青藏高原中部甘孜—玉树断裂的玉树段上,在玉树县结古镇至隆宝镇之间产生了一系列包括剪切破裂、张剪切破裂、压剪切破裂、张性破裂及其不连续岩桥区出现的鼓包或陷落坑(拉分盆地)、高寒地区特有的冰裂缝等地表破裂单元,它们斜列组合成整体走向约 300° 、长约65 km、最大同震左旋位移2.4 m的地表破裂带,具有变形局部化的基本特征。玉树地震地表破裂带整体上可划分为长约15 km的结隆次级地表破裂带和长约31 km的结古次级地表破裂带,两者呈左阶羽列,其间无地表破裂段长约17 km,对应于 $M_W6.4$ 和 $M_W6.9$ 两个次级地震事件,地表破裂类型、基本组合特征等显示出甘孜—玉树断裂两盘块体的运动方式以纯剪切的左旋走滑为主,从一个方面反映了青藏高原物质存在着向东的逃逸和挤出现象。

关键词 玉树地震, 地震地表破裂带, 甘孜—玉树断裂, 逃逸构造, 青藏高原

Abstract: Field investigations show that the Yushu, Qinghai Province, $M_S7.1$ earthquake occurred on the Yushu segment of the Ganzê-Yushu fault in the Qinghai-Tibetan Plateau. Its surface rupture zone is distributed along the Yushu segment between Longbao Town and Jiegu Town and consists of shear cracks, transtensional cracks, transpressional cracks, tension cracks, mole tracks in right-stepovers or small pull-aparts in left-stepovers between en echelon cracks with left-lateral component. Those ruptures are en echelon to form an $\sim 300^\circ$ - striking earthquake surface rupture zone with a total length of about 65 km. The maximum co-seismic left-lateral displacement is 2.4 m. The width of the surface rupture zone is in general less than 30 m, showing a localized rupturing feature. The Yushu earthquake surface rupture zone can be divided into two relatively independent sections in left-step: the Jielong section ~ 15 km long with a maximum left-lateral slip of 0.66 m and Jiegu section ~ 31 km with a maximum left-lateral slip of 2.4 m, and between them is a 17 km-long-section where no surface ruptures occurred, which correspond to two subevents with $M_W6.4$ and $M_W6.9$, respectively. This kind of the surface rupture pattern shows that the Ganzê-Yushu fault, a seismogenic fault of the Yushu earthquake, is dominated by a pure left-lateral faulting and the eastward escape of the Qinghai-Tibetan Plateau exists.

Keywords Yushu Earthquake, Earthquake surface rupture zone, Ganzê, -Yushu fault, Escape tectonics, Qinghai-Tibetan Plateau

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