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GPS观测及断裂晚第四纪滑动速率所反映的青藏高原北部变形

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Deformation on the northern of the Tibetan plateau from GPS measurement and geologic rates of Late Quaternary along the major fault

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摘要

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摘要 断裂晚第四纪滑动速率及现今GPS观测揭示了青藏高原向北扩展与高原边缘隆升的运动特征.主要断裂晚第四纪滑动速率及跨断裂GPS应变速率的结果表明,青藏高原北部边缘的断裂以低滑动速率(<10 mm/a)为主,特别是两条边界断裂:阿尔金断裂和海原—祁连山断裂.两条主要边界断裂上的滑动速率分布显示了断裂间滑动速率转换及调整特征.阿尔金断裂自 95° E以西的 $8\sim 12$ mm/a稳定滑动速率,向东逐渐降低到最东端的约 $1\sim 2$ mm/a,而海原断裂自哈拉湖一带开始发育后滑动速率为 $1\sim 2$ mm/a,到祁连一带(101° E以东)增大到相对稳定的 $4\sim 5$ mm/a,直到过海原后转向六盘山一带,滑动速率降低到 $1\sim 3$ mm/a,甚至更低.滑动速率的变化及分布特征显示,阿尔金断裂滑动主要是通过祁连山内部隆起及两侧新生代盆地变形引起的缩短来吸收的,海原—祁连山断裂的低滑动速率及沿断裂运动学特征表明断裂尾端的陇西盆地变形及六盘山的隆起是断裂左旋走滑速率的主要吸收方式.这一变形特征表明,青藏高原北部边缘的变形模式是一种分布式的连续变形,变形发生自高原内部,边界断裂的走滑被高原内部变形所吸收.

关键词 GPS观测, 晚第四纪滑动速率, 边界断裂, 连续变形, 青藏高原北部

Abstract: GPS measurements and late Quaternary fault slip rates reveal the kinematic pattern of outward growth of the northern margin of the Tibetan Plateau. Base on the geologic data and GPS velocity slip rates of major boundary faults are less than 10 mm/a including the Altyn-Tagh fault and Haiyuan- Qilianshan fault. The distributions of slip rates along the two major faults show constant slip rate along their middle portion and decrease toward their ends. For example, the left-lateral slip rates on the central segment of Altyn-Tagh Fault appear to be in the range of $8\sim 12$ mm/a, but decreases eastward to only $1\sim 2$ mm/a near 97° E. On the Haiyuan-Qilianshan fault, slip rates are $1\sim 2$ mm/a in its western segment, and increase to $4\sim 5$ mm/a in its eastern and middle segments, and then decrease to $1\sim 3$ mm/a near its eastern end near the Liupan Shan. This kind of slip distribution suggests that almost all motion along a strike-slip fault is accommodated by crustal shortening or convergence near the ends of the strike-slip fault. The crustal shortening across the Qilian Shan absorbs strike-slip along the Altyn Tagh fault. The convergence in Liupan Shan accommodates left-lateral slip along the Qilian-Haiyuan fault. Our studies show that tectonic deformation occurred mainly within the northern Tibetan Plateau, and that the rule of strike slip faulting has been reconciling differences of crustal shortening or crustal thickening rather than extruding crustal blocks out of the plateau interior.

Keywords GPS measurements, Late Quaternary slip rate, Boundary fault, Continuous deformation, The

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