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Constraints on kinematics of subsurface thrusting and deforming rates by late Pleistocene fluvial terraces along the Eastern Qilian Shan, NE Qinghai-Tibet Plateau

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The northwest-southeastern treading Qilian Shan Mountain, margining the northeastern Qinghai-Tibet Plateau, has been uplifting and deforming related to thrust faults bordering the mountain range in the north. By now, the fault thrust rate and how the mountain was uplifted and deformed is poorly documented along the eastern Qilian Shan. In this study, several flights of late Pleistocene fluvial terraces along two rivers (Xiying River and Jinta River), sourced from the mountain crest and flowing transecting these thrust faults and folds, are surveyed by differential GPS with the accuracy of lower than 10 centimeters. Meanwhile, the abandonment times of terrace surfaces were dated by OSL dating on the overlying loess above the fluvial deposits. Analysis results of height data show that fluvial terrace surfaces were obviously deformed related to thrusting and folding. At first, we derive an average uplift rate of 0.05~0.2 mm/yr, which is contributed by folding along the low-mountain range (with elevation from 2000 m to 3000 m), since 120 ka B.P. When the uplift contributed by thrust is added, the total rate of uplift would be 0.45-0.60 mm/yr. The second, by the geometry of terrace surface height, the thrust geometry under the surface is deduced. Along the low-mountain range, the dip angle of thrust is bended from ~30^o to ~50^o at the depth of around 15 km, and at the depth of ~20 km, the thrust dip angle is changed to ~26^o Along the Huangcheng-Taerzhuang Fault, which bordering the high-mountain range (with elevation from 3000 m to 5000 m) and the low-mountain range, the dip angle is bended from ~70^o at the surface to ~47^o below the depth of ~5 km, and at the depth below ~23 km, the dip angel of the thrust is changed to >30^o. We conclude that in the late Quaternary, the deforming of mountain range along the eastern Qilian Shan is accomplished both by thrusting and folding; the difference of uplift rates between the high-mountain range and low-mountain range is mainly caused by different thrust angle and slip rate in the depth along the eastern Qilian Shan Mountain.

Key Words: Qilian Shan, fluvial terrace, uplift rate, thrust fault, mountain deformation

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