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Rates and kinematics of deformations along the eastern Qilian Shan Mountain, NE Tibetan Plateau, constraint by deformed fluvial terraces

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We derive slip rates of a series of thrust faults and deforming patterns along the eastern Qilian Shan Mountain by detailed survey of deformed fluvial terraces and OSL dating on the terrace surfaces. The northwest-southeastern treading Qilian Shan Mountain, margining the northeastern Tibetan 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 Quaternary fluvial terraces along two rivers (Xiying River and Jinta River), sourced from the mountain crest and flowing transecting these thrust faults, 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 near these thrust faults, and slip rates of these thrust faults were calculated by deformations and age data. Late Quaternary vertical slip rates of the Huangcheng-Taerzhuang Fault, the KangNingQiao Fault, the NanYing Fault, and the QingDaBan Fault are estimated as 0.15-0.28 mm/a, 0.26-0.47 mm/a, 0.21-0.37 mm/a, and 0.09-0.30 mm/a, respectively. By the geometry of terrace surface height, we find that the hanging-walling planes are slightly warped along these thrust faults, which indicates that the folding amount in the hanging wall is relatively small. This evidence suggests that in the late Quaternary, the deforming of mountain range along the eastern Qilian Shan is accomplished mainly by thrust, and the mountain is uplifted through approximately uniform uplift in hanging-wall planes of the series of thrust faults.