Research Advances

The First Quantitative Slip-Rate Estimated Along the Ashikule Fault at the Western Segment of the Altyn Tagh Fault System

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As one of the longest strike-slip fault in Asia, the Altyn Tagh Fault (ATF) defines the northern boundary of the Tibetan Plateau and plays a significant role in accommodating the deformation resulting from the India-Asia convergence. Slip-rate and seismic behavior of the fault are critical to understand the present-day kinematics

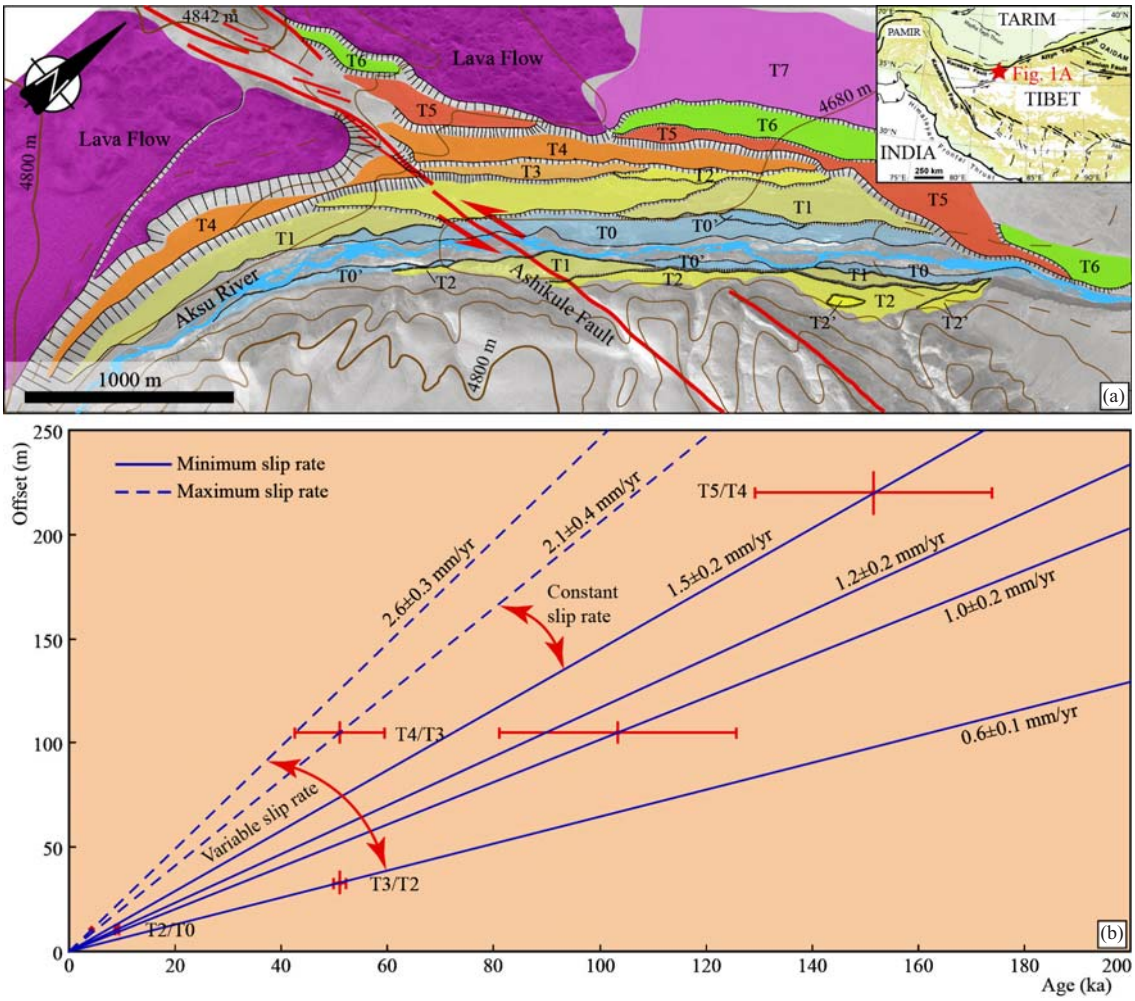

Fig. 1. (A), Interpretation of satellite image shows that the terraces of the Aksu River are sinistrially offset by the Ashikule Fault. Red star in the inset figure shows the location of the study site; (B), slip-rates of the Ashikule Fault constrained with different terrace riser offsets and corresponding surface ages.

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of collision tectonics in Asia, and are viewed as important factors in evaluating whether the Indo-Asian convergence is taken up primarily by regionally distributed deformation or kinematically by large strike-slip fault systems that separate large relatively undeformed blocks. Thus, it has been a long-term focus for geologists to study the ATF slip-rate. Till now, considerable research has focused on the AFT slip-rate along the accessible eastern and central segments of ATF, whereas little is understood about the western segment, which is more remote and at a very high elevation.

The Ashikule Fault is located at the easternmost part of the western ATF, which is the complex triple junction between the Karakax fault, the Longmu-Gozha Co fault, and the central ATF. In addition, this area is a significant tectonic transition zone with intense earthquake and volcanic activities in western Tibet.

Our interpretation of satellite images suggests that the terraces of the Aksu River have been sinistrally offset by the Ashikule fault. Field investigations were further conducted to perform detailed geological and geomorphological measurements at this site. We measured the horizontal offsets of the terrace risers with Total Station and collected quartz pebbles for cosmogenic nuclide ^{10}Be dating from each of the terrace surfaces. Combining the measured offset and the dating results, here we provided the first quantitative late Quaternary slip-rate along the Ashikule segment of ATF, which is 0.6–2.6 mm/yr, with a preferred rate of 1.5–2.1 mm/yr if constant in time. Although the Ashikule Fault is just one of the three branches of the western ATF, when assuming that all the three branches slip at a similar rate, this result yields a relatively low total slip-rate along the western ATF. This is more consistent with the geodetic slip-rate (<10 mm/yr), but far from the geological slip-rate (10–30 mm/yr). Geometry and kinematics of the faults in the study area indicate that the Ashikule Fault, the Karakax Fault, and the Longmu-Gozha Co Fault all belong to the same ATF system. The ATF is still propagating to the SW at present, and the Longmu-Gozha Co Fault now is the youngest southwest segment of ATF.

Acknowledgements

This work is supported by the National Natural Sciences Foundation of China (Grants No. 41202156 and 41330211), China Geological Survey (Grants No. 12120115026901 and 12120115027001), and the Institute of Geology, CAGS (Grant No. J1520).