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# Comparison of GPS and Quaternary slip rates: Insights from a new Quaternary fault database for Central Asia

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Previous studies related to the kinematics of deformation within the India-Asia collision zone have relied on slip rate data for major active faults to test kinematic models that explain the deformation of the region. The slip rate data, however, are generally disputed for many of the first-order faults in the region (e.g., Altyn Tagh and Karakorum faults). Several studies have also challenged the common assumption that geodetic slip rates are representative of Quaternary slip rates. What has received little attention is the degree to which geodetic slip rates relate to Quaternary slip rates for active faults in the India-Asia collision zone. In this study, we utilize slip rate data from a new Quaternary fault database for Central Asia to determine the overall relationship between Quaternary and GPS-derived slip rates for 18 faults. The preliminary analysis investigating this relationship uses weighted least squares and a re-sampling analysis to test the sensitivity of this relationship to different data point attributes (e.g., faults associated with data points and dating methods used for estimating Quaternary slip rates). The resulting sample subsets of data points yield a maximum possible Pearson correlation coefficient of $\sim$0.6, suggesting moderate correlation between Quaternary and GPS-derived slip rates for some faults (e.g., Kunlun and Longmen Shan faults). Faults with poorly correlated Quaternary and GPS-derived slip rates were identified and dating methods used for the Quaternary slip rates were examined. Results indicate that a poor correlation between Quaternary and GPS-derived slip rates exist for the Karakorum and Chaman faults. Large differences between Quaternary and GPS slip rates for these faults appear to be connected to qualitative dating of landforms used in the estimation of the Quaternary slip rates and errors in the geomorphic and structural reconstruction of offset landforms (e.g., offset terrace riser reconstructions for Altyn Tagh fault). Other factors such as a low density in the GPS network (e.g., GPS rate based on data from a single station for the Karakorum fault) appear to also contribute to the mismatch observed between the slip rates. Taken together, these results suggest that GPS-derived slip rates are often (but not always) representative of Quaternary slip rates and that the dating methods and sampling approaches used to identify transients in a fault slip rate history should be heavily scrutinized before interpreting the seismic hazards for a region.