Empirical relationships among triangular facet slope, facet height and slip rates along active normal faults from ASTER DEM data

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ASTER DEM data (30-m pixel size) are used to derive empirical relationships between triangular facet attributes and slip rates along active normal faults. We sampled 232 triangular facets along 10 normal faults in Greece and Bulgaria that slip with rates from 0.1 mm/yr up to 1.3 mm/yr. The studied normal faults accumulate Quaternary tectonic strain in well-known extensional provinces, such as central Greece, Crete and SW Bulgaria. The normal fault footwalls analysed herein have been developed under similar long-term climatic conditions. It is suggested that two key geometrical features of the youngest generation of triangular facets (slope angle and height) can provide useful metrics to assess rates of deformation when seismological and geodetic data are lacking or not found in sufficient quantity to make reasonable assessments. Our derived empirical relation between slip rate and facet slope angle is: $Y=0.057 \cdot X-1$ where Y is fault slip rate (mm/yr) and X is facet slope angle (degrees), with an $R^2 = 0.728$. It is envisaged that our analysis may be helpful in assessing seismic hazard along normal faults with similar facet characteristics in other extensional settings.