Geophysical Research Abstracts
Vol. 15, EGU2013-11563-4, 2013
EGU General Assembly 2013

Analysis of surface structures of major strike-slip faults

Shang Yu Hsieh (1) and Franz Neubauer (2)

(1) Department of Geoinformatics - Z_GIS, University of Salzburg, Austria., (2) Dept. Geography and Geology, University of Salzburg, Hellbrunnerstr. 34, A-5020 Salzburg, Austria

Strike-slip faults commonly appear with complex fractures and deformation structures on the surface, which also reveal the 3-D geometry with variable structures at depth. The aim of our study is finding the systematic features and correlations of various surface expressions including width, length, height and angle (to the main fault trace) of individual structures like pressure ridges, sag ponds, riedel and anti-riedel faults and oversteps, and also doing a classification with these data. The variation might by caused by distinct convergence angles along strike-slip fault. We study the above mentioned properties on Altyn Tagh fault (ATF), Kunlun, San Andrea and Greendale (Darfield earthquake) faults, which are large strike-slip tectonic structures accommodating major displacement along plate boundaries. Especially the recent events of 2001 Kunlun earthquake and 2010 Darfield earthquake allow a detailed study of structures formed by a single earthquake.
Along the fault valley of a 610 km segment of ATF, many large-scale pressure ridges, few pressure basins and horizontal offsets of wadi channels were found; similarly, around 20 features with large scale pressure ridges and pressure basins are found in Carrizo Plain of San Andreas fault. Surface ruptures are uncommon, and dominated by anti-riedels in the case of the Altyn fault. Interpretations show the range of length, width and height in pressure ridges located between 150 and ∼6400 m, 35 and ∼800 m, and 1 to ∼80 m, respectively, along ATF and 255 to ∼5750 m, 33 to ∼800 m, 2 to ∼65 m in Carrizo plain of San Andreas fault. These parameters exhibit a good correlation among each other implying a common cause.

Compared with these two strike-slip faults, fault valley portions of the Greendale and Kunlun faults show more surface ruptures for instance riedel shears and anti-riedel structures, which have been caused by the last major earthquake, and also the scale of deformations along the ATF and San Andreas fault is much larger by numerous cumulative earthquakes. Surface ruptures has certain length and width of 5 m to ∼200 m, 3 to ∼350 m in the Kunlun fault (Lin and Nishikawa, 2011) and 10 to ∼450 m, 30 to ∼300 m in Greendale fault (Quigley et al., 2012).

Beside the scale difference, the statistical approach also applied in the parameters of these surface features, result shows in these four faults, there are specific correlations exist among lengths, width, height and convergence angle which is also the key point to explore the depth of these structures with analog experiments.
A likely explanation for the differences between Altyn/San Andreas faults and Kunlun/Glendale fault is the transpressive nature of Altyn/San Andreas faults and the pure strike-slip/transform nature of Glendale/Kunlun faults implying a small convergence angle in the latter case.