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Geomorphic expression of strike-slip faults: field observations vs. analog experiments: preliminary results

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The aim of this project is to study the surface expression of strike-slip faults with main aim to find rules how these structures can be extrapolated to depth. In the first step, several basic properties of the fault architecture are in focus: (1) Is it possible to define the fault architecture by studying surface structures of the damage zone vs. the fault core, particularly the width of the damage zone? (2) Which second order structures define the damage zone of strike-slip faults, and how relate these to such reported in basement fault strike-slip analog experiments? (3) Beside classical fault bend structures, is there a systematic along-strike variation of the damage zone width and to which properties relates the variation of the damage zone width.

We study the above mentioned properties on the dextral Altyn fault, which is one of the largest strike-slip on Earth with the advantage to have developed in a fully arid climate. The Altyn fault includes a ca. 250 to 600 m wide fault valley, usually with the trace of actual fault in its center. The fault valley is confined by basement highs, from which alluvial fans develop towards the center of the fault valley. The active fault trace is marked by small scale pressure ridges and offset of alluvial fans. The fault valley confining basement highs are several kilometer long and ca. 0.5 to 1 km wide and confined by rotated dextral anti-Riedel faults and internally structured by a regular fracture pattern. Dextral anti-Riedel faults are often cut by Riedel faults. Consequently, the Altyn fault comprises a several km wide damage zone. The fault core zone is a barrier to fluid flow, and the few springs of the region are located on the margin of the fault valley implying the fractured basement highs as the reservoir. Consequently, the southern Silk Road was using the Altyn fault valley.

The preliminary data show that two or more orders of structures exist. Small-scale develop during a single earthquake. These finally accumulate to a several 100 m wide fault core, which is in part exposed at surface to arid climate and a km wide damage zone. The basic structures of analog experiments can be well transferred to nature, although along strike changes are common due to fault bending and fracture failure of country rocks.