Geophysical Research Abstracts
Vol. 21, EGU2019-13109-1, 2019
EGU General Assembly 2019

Assessing seismic hazard: the case of the Western Kunlun range and southwestern Tarim basin region (Xinjiang, China)

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The Western Kunlun Range (WKR) is a slow converging orogen located at the northwestern border of the Tibetan Plateau, along the southwestern margin of the endorheic Tarim basin. Its low deformation rate cannot be recorded by the current geodetic techniques and the available catalogues of recorded seismicity are generally not long enough to trace back the occurrence of important events. However, a set of earthquakes in the 1950's and the recent Mw 6.4 2015 Pishan earthquake remind us that this region is still active. Therefore, the seismic hazard of the WKR is still to be explored.
Thanks to a morphological and structural study of the mountain front based on topographical and geological maps, field observations and available seismic profiles, we identified the major active faults of the WKR. This fault system branches into a shallow decollement that emerges at the surface 150-180 km further north within the Tarim Basin. Such important dimensions imply the possibility of major M $\geq$ 8 earthquakes in the case that the whole decollement is presently seismically locked and fully ruptures in one single seismic event.

To have a better understanding on how the deformation has been and is still accommodated through this large system, we conduct a new morphological and structural analysis of the most frontal ramp emerging at the surface at the Mazar Tagh ridge. Despite the current aridity of the region, a set of terraces has been identified and sampled in the field for OSL and 10Be dating. Using Pléiades images and derived DEMs, we mapped theses terraces to quantify the amount of deformation recorded by these markers. Additionally, a structural cross-section was built thanks to the combination of a seismic profile crossing the ridge and field measurements, allowing us to get the precise geometry of the emerging ramp. Our results help us get a better knowledge on the structure and kinematics of this range and its deformation front, and bring valuable new constraints on seismic hazards in this slowly deforming region.