



Co-seismic surface rupture and normal faulting produced by the 2008 Ms 7.3 Ashikule earthquake, Xinjiang, China

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On 20 March 2008, at 22:33:01 UTC, a Ms \approx 7.3 earthquake struck the Pingding Range, south of the Ashikule basin and northeast of the Guliya ice cap in the Western Kunlun Mountains (Xinjiang, China). The earthquake (Ashikule earthquake) produced a \geq 32 km-long zone of fresh scarps and cracks, mostly along the large normal fault bounding the west side of the range, above 5400m asl. (West Pingding fault). Based on geometry, geomorphology and co-seismic deformation, the surface rupture can be divided into three sub-segments. The central, N 170°E-trending segment is simplest, with fairly linear, continuous breaks cutting the base of faceted spurs, about one third of the total relief upslope. The more complex northern segment, which veers eastwards away from the range-front to cut through bedrock, is mostly composed of right-stepping cracks striking NE-SW to N-S. To the north, it dies out into an “en-echelon”, left-lateral zone of open fissures in the flat, gravel flood-plain of the Yulong Kash before reaching the active, NNE-striking faults and aligned volcanic vents that splay southward from the Achikule branch of the Altyn Tagh fault. Past a sharp 30°-W bend near 35°27'N, the NNE-trending, southern segment of the rupture slices across large glacier tongues with flanking lateral moraines, and snow-covered, till-mantled slopes, before disappearing southwards beneath the eastern Guliya ice-cap.

Along the central segment, the main scarp-faces dip steeply (60 to 85°W), exposing coarse, poorly consolidated glacial till or debris-flows. Large, boulder-filled, free-faced cracks reach widths of up to \approx 8-10 m, probably due to inner-wall collapse. Total station profiles show surface throws ranging between \approx 1 and \approx 5m, a few of them cumulative. Many profiles, however, show little surface-slope offset overall, implying that slip beneath the coarse Quaternary deposits may have occurred on a plane dipping little more than \approx 30° westwards, roughly parallel to the topographic gradient. The geometry of the scarps and rupture is consistent with local 80-90°E trending extension, in keeping with the slip-vector direction (83-84°E) on the west-dipping focal mechanisms' nodal planes.

Together with the eruption of one Achikule basaltic vent in 1951, the occurrence of this large earthquake on the West Pingding normal fault confirms the existence of a young, important active link between the Altyn Tagh and Gozha faults. This left-lateral, transtensional fault zone probably takes up a significant fraction of the eastward extrusion of central Tibet relative to the Tarim, reducing the amount and rate of sinistral shear between the latter and the Aksaichin-Tianshuihai block along the Karakax fault, main other branch of the Atyn Tagh system west of 83°E.