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Observation and Modeling of the Yutian Earthquake (Mw7.1) on March 20, 2008 in NW Tibet

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On 20 March 2008, an earthquake (Mw7.1) struck Yutian county, Xinjiang, China. Here we report our detection of the associated crustal deformation signals using ascending ALOS/PALSAR and descending Envisat/ASAR data, and its fault source model. Except for snow covered areas, PALSAR data covered almost the entire deformed area. PALSAR data show that maximum changes in radar line-of-sight (LOS) reached ~170 cm in extension, and its azimuth offset data revealed >100 cm changes. The earthquake rupture reached to the surface, and its strike direction changes in the middle of the fault. The earthquake source mechanism was, as a seismological study already suggested, of normal faulting, but the slipped areas were much smaller than the reported preliminary modeling derived from teleseismic data.

The west-dipping normal fault earthquake is the largest event ever recorded near the boundary between Tarim basin and Tibet. The inferred bended fault geometry as well as the absence of large thrust events in recorded history may suggest complicated fault distributions in the upper- to lower- crust.

Keywords: Tibetan plateau, earthquake, normal fault, SAR, crustal deformation