

Extensive surface fault rupture associated with the 2005 Pakistan earthquake of Mw 7.6

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<http://unit.aist.go.jp/actfault/activef.html>

Our reconnaissance field investigation conducted in late January 2006 revealed the outline of the surface fault rupture associated with Mw 7.6 earthquake in northern Pakistan on October 8, 2005. Among the historically known large earthquakes occurred along the Indian-Eurasian collision zone, this earthquake produced extensive surface rupture for the first time.

The earthquake produced a 65-km-long, NW-SE-trending surface rupture from Balakot (N34d33.2m, E73d20.9m) in northwest via north of Muzaffarabad, to northwest of Bagh (N34d04.6m, E73d44.6m) in southwest. Vertical offset up to northeast by 2-5.5m occurred along the 50-km-long main section of the surface rupture accompanied by slight right-lateral offset. To the north of Muzaffarabad, we found a WSW-ENE-striking short section with double-bend geometry of the strand. Along this section, a vertical offset ranges 4-5 m and net-slip ca. 9 m on the displaced flood plane of Nilam river. Along the southeast part of the rupture, we found that the surface faulting is associated with right-lateral slips smaller than several-ten-cm at two sites by the mountain road to the town of Bagh.

Characteristics of geometry and slip-distribution of the rupture suggest that the surface rupture initiated north of Muzaffarabad and propagated bilaterally along the northwest section and central to southeast sections. The field evidence is very consistent with both the sub-surface source process based on seismogram data, and surface deformation analyzed from satellite observations.

The surface ruptures took place along the pre-existing active faults, which have been active during the late Quaternary (e.g. Nakata et al., 1991; Nakata and Kumahara, 2006). Extremely severe damage occurred to the houses located on and close to the surface rupture is attributed to ground failure due to faulting as well as strong shaking.