

NEOTECTONICS OF PAKISTAN: AN INSIGHT FROM NAGARPARKAR, PESHAWAR PLAIN, NANGA PARBAT, KALABAGH AND KASHIR

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Pakistan occurs at the Himalayan Plate Boundary. Several segment of the Himalayan Plate Boundary in Pakistan have active faults superimposed on Plate-Boundary Faults. Examples of neotectonics are primary well developed at Makran coast, Chaman Fault, Quetta Syntaxis, Kalabagh Reentrant, Peshawar Plain, Nanga Parbat and Kashmir. In this presentation an appraisal of neotectonic activity in some of these active tectonic zones is presented.

Nagar Parkar Region, Rann of Kuchch: The Bhuj earthquake of June 2001, despite its epicentring at a distance of over 200 km from SE Pakistan caused wide-spread damages in SE Sindh. A damage to life and property occurred in SE Sindh from Nagar Parkar to Hyderabad resulting in casualties of 16 lives and injuries to hundreds of people, in addition to destruction of built environment. Widespread lateral spreading and liquefaction features formed, especially in the Rann of Kuchch region.

Kalabagh Reentrant: The eastern margin of the Kalabagh reentrant between Mianwali and Kalabagh is an active strike-slip fault forming a lateral ramp to the Salt-Range thrust sheet. The Quaternary Kalabagh conglomerates show over 16 km right-lateral displacement. However, there are several additional features including excellent fault scarps in river alluvium as well as displacement of alluvial fans which lend support to activity on this fault in recent geological times. Interestingly, there is no record of devastating earthquakes in Potwar-Salt Ranges in the historical past. This enigma is subject of ongoing GPS geodesy studies in the Potwar plateau.

Peshawar Plain: Whereas the Peshawar Plain is considered principally to have formed because of uplift associated with MBT ~ 8 MA ago, there are several active faults which displace the present-day drainage suggesting continued neotectonic activity in the region. Active faults exposed in the Peshawar Plain include 1) Darband Fault at Tarbela and Attock, 2) Nowshera and 3) Cherat Ranges.

Nanag Parbat Syntaxis: The Western margin of the Nanga Parbat Syntaxis, defined by the Main Mantle Thrust of Eocene age is superimposed by the active Raikot-Sassi Fault. Extensive neotectonic features are exposed along this fault trace for a distance of over 100 km from Sassi in the north to Bunar Gah in the south. Medium to large earthquakes dating from 1846 to 2002 are associated with this active fault zone.

Kasmir-Balakot Region: The western margin of the Hazara-Kashmir Syntaxis is defined by an active fault superimposed on MBT/Panjal Thrust. This fault from Muzafarabad southeastward follows the upper Jhelum River and crosses over to Bagh. Kasmir Earthquake 2005 produced extensive neotectonic features along this active fault including spectacular co-seismic and post-seismic earthquake ruptures. The Muzafarabad-Kohala segment of the Jhelum river is lined by a separate active fault structure called Jhelum Fault, which again shows evidence of neotectonics.

In summary, Pakistan has several tectonic zones manifesting neotectonic activity. Two special features of the neotectonic activity in Pakistan include: 1) superimposition of active faults on older faults (e.g., Raikot Fault on MMT; Kashmir Fault on MBT), and 2) the syntaxial structures are particularly associated with neotectonic activity (e.g., Nanga Parbat Syntaxis, Hazara-Kashmir Syntaxis, Kalabagh Reentrant, Besham Syntaxis and Quetta Syntaxis).