

Bookshelf faulting in the Ziarat earthquake sequence, Northern Baluchistan, October 2008

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The damaging earthquakes occurred in 2008 in the Pishin/Ziarat region NE of Quetta, where 300 people were killed by landslides and by the collapse of adobe structures. The deformation velocity field derived from GPS measurements before and after the earthquake indicates that earthquakes were associated with a shear zone trending NW/SE underlying the fold systems that near Pishin and Mach trend approximately eastward. The Pishin/Mach shear zone defines a transition in geological structure from the partitioned thrust/wrench fault system of the Northern Kirthar ranges to its south, to the Sulaiman lobate thin-skinned tectonics in the Quetta transverse zone to its north. The forces responsible for dextral shear are thought to originate from a 15° restraining bend on the plate boundary near Chaman. The SE extent of the shear zone is uncertain but possibly, it is responsible for the damaging earthquake of 1909 near Sukkur, >200 km to the SE. From GPS measurements we estimate the slip rate on the Pishin/Mach shear zone is 5-10 mm/yr, a range that is consistent with the kinematics of the restraining bend geometry. It is inferred that at least 8 parallel faults \approx 15 km apart, length 15-20 km exist in the shear zone. The likelihood of maximum of Mw 6.5 earthquake due to fault dimensions and events will occur in every 10-20 years.