# Strike-slip reactivation of regional scale thrust faults with moderate dips

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Moderately-dipping faults are considered to be unfavorably oriented for strike-slip motion. Nevertheless, strike-slip earthquakes on faults with dips of ~35-45° have caused fatalities and considerable property destruction in Japan and elsewhere. These include the 1923 Great Kanto earthquake (Mw 7.9, central Japan), the 2013 Balochistan earthquake (Mw7.7, south central Asia), and several paleoseismic events on the Median Tectonic Line (MTL) (estimated M > 6.8, southwest Japan). In each case, the source fault originated as a thrust fault in a convergent tectonic setting and was reactivated as a strike-slip fault in a succeeding intermediate-type setting. In the Great Kanto earthquake, the Sagami megathrust showed right-lateral-reverse slip in a ratio of strike-slip to dip-slip of approximately 2:1[1]. Geodetic models suggest that strike-slip movement may be the norm for this segment of the megathrust, where the plate boundary more or less aligns with the motion direction of the subducting plate[2]. In Balochistan, the 2013 earthquake propagated on the 45° NW-dipping Hoshab fault with nearly pure strike-slip motion[3]. The Hoshab fault originated in the thrust belt of the Makran accretionary wedge and is being repositioned into the strike-slip stress field caused by the Indian plate sliding past the Afghan block (Eurasia). In southwest Japan, the MTL may be a paleo-megathrust with a long history of oblique slip[4]. Now it accommodates right-lateral slip at the slip-partitioned Nankai subduction zone where paleoseismic evidence shows a recurrence interval of 1000-3000 yr for large earthquakes with 5-8 m of lateral slip[5]. While the likelihood of strike-slip reactivation of a moderately-dipping fault is expected to be small, the occurrence of large-magnitude earthquakes of this type suggests that we should reexamine this assumption. Even if uncommon, such faults may be more hazardous than anticipated if erroneous assumptions about fault geometry are used in hazard and strong ground motion estimates. Theoretical models have provided an initial insight into the factors that contribute to fault reactivation, but case studies show that the phenomenon is complex. For this study, we use an integrative approach to look at the much-investigated MTL in an attempt to understand the factors that contribute to its unusual behavior. We conclude with the suggestion that regions where thrust structures form in compressive regimes, now changed to strike-slip, be assessed to determine the orientations of known strike-slip faults, for example, the Tibetan plateau and the Indo-Burman wedge.

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