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Strike-slip earthquakes on moderately-dipping faults

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Moderate-angle faults that form under compressive stress regimes in subduction zones can slip laterally if the stress field subsequently reorients to strike-slip. We present three examples from Japan and Pakistan in which regional-scale thrust faults created in compressional structural settings have been reactivated as strike-slip faults in new, largely subhorizontal, stress fields. (1) In SW Japan, the Median Tectonic Line has a dip of 30-40°, yet it slips laterally in the slip-partitioned Nankai subduction margin. (2) Likewise, the source fault for the M7.9 Great Kanto earthquake was the Sagami megathrust, yet it exhibited predominantly strike-slip movement in the 1923 earthquake. (3) In Pakistan, the 2013 M7.7 Awaran earthquake occurred on a fault plane that dips 45° and showed largely strike-slip movement. These are regional-scale, moderate-angle faults that originated as thrust faults at the subduction interface (or in its associated fold-and-thrust belt) and now exhibit near-horizontal slip. While their current slip behavior suggests they should be oriented vertically or near-vertically, they are not. They have inherited a non-typical inclined geometry. Under what conditions does a thrust fault reactivate in a strike-slip stress field? The inherited fault plane must represent a significant preexisting crustal weakness whose coefficient of cohesion exceeds its coefficient of friction, allowing it to fail preferentially despite its unfavorable orientation. Details of the slip behavior for these faults in time and space suggest complex dynamics which will require further scrutiny.