

## Rupture of the Indian slab in the 2011 Mw 6.9 Sikkim Himalaya earthquake and its tectonic implications

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Unlike the other Himalayan segments, the Sikkim-Bhutan Himalayan region apparently does not have any significant thrust faulting earthquakes typical to the Himalayan convergence. In fact, this region has prominent strike-slip earthquake occurrences over the depths of 40-120 km, indicating intraslab deformation of the under-thrusting Indian plate.

Here an attempt is made to infer the ongoing slab deformation, through a reanalysis on the source process of the largest ever recorded strike-slip earthquake from this region, the 18 September 2011, Mw 6.9 Sikkim earthquake. Our results favour a NE-SW trending steeply inclined sinistral source zone rupturing the Indian slab. In addition to this, we observed a unimodal distribution of earthquake focal depths beneath this region, representative of a strong brittle Indian slab, depicting a scenario that may eventually lead to the break-up of the lithosphere.

Further, our analysis shows that the lithospheric stress regime is transpressive throughout the crust beneath the Lesser and Higher Himalayas. Here we suggest the development of vertical tear faults, beneath the eastern Nepal-Bhutan Himalaya region, within the Indian slab, to explain the lower crustal strike-slip earthquake occurrences. This tearing process could be related to the variation in along arc convergence rates probably induced by the subduction of sub-surface ridges at this zone.