

Coastal geomorphology as a proxy of large paleothrust earthquakes along the Andaman Trench

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Estimating hazards from earthquakes and tsunamis along subduction zones is of significance to coastal communities. Here, we discuss the coastal geomorphology of selected sites in the Andaman Islands, which lie within the rupture zone of the 2004 Sumatra-Andaman earthquake. As part of the near-source region, these islands witnessed considerable geomorphic changes, both before and after the 2004 earthquake, which may be related to the maturity of a megathrust subduction zone earthquake cycle. Assuming that these geomorphic landforms are properly preserved and attributed to the right sources, it is possible to build the history of large paleothrust earthquakes for the Andaman Islands. Given that these landforms are a result of similar processes through time, our sites are broadly divided as regions that subsided or were uplifted in 2004.

At Hut Bay and Interview Island, uplifted coralline terraces were mapped, as were stream inlets that cut through the newly-formed as well as older terraces. Samples collected from these locations include wood pieces from trees embedded in the stream bank, shells from pebble-rich layers along the exposed bank as well as coral fragments from the terraces themselves. At Port Blair, large stretches of land subsided in 2004. While several farmlands remain inundated beneath the present-day tidal-line, several mangroves trees died in situ, their roots being preserved in the shallow subsurface. Along a stream bank, a similar root horizon was identified 1m below the present day surface which was sampled at multiple locations. Additionally, a shell sample was collected from within the paleo root-zone.

The ages of these samples were estimated using AMS radiocarbon dating, and they cluster at AD 1100, AD 1500, and AD 1900. Though these geomorphic landforms may be the result of other coastal processes, either regional or global, we believe that these ages, with corroborating evidence from several studies in the Andaman Islands and from coastlines in Sri Lanka, mainland India, Sumatra, and Thailand are representative of large earthquakes in recent history, some of may have been tsunamigenic.

Keywords: 2004 Sumatra-Andaman earthquake, Coastal geomorphology, Andaman Islands, Uplifted terraces, Subsided lowlands, Paleothrust earthquakes