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The Style of Crustal Deformation and Seismic History Associated with the 2004 Indian Ocean Earthquake: A Perspective from the Andaman-Nicobar Islands

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The Indian Ocean earthquake of December 26, 2004 has led to significant ground deformation in the Andaman-Nicobar region. These changes observable from coastal morphology, biological indicators and coseismic GPS data suggest non-uniform deformation along the arc, both in its horizontal and vertical components. The field observations indicate that the southern islands have subsided by 1-1.5 m while the western parts of the south, middle, and North Andaman have been elevated by $>$1 m. The coseismic uplift and subsidence of the islands result from the transient changes, controlled also by the location of these sites with respect to the subduction front. An anomalous behavior was observed in the north Andaman, where the field observations and GPS estimates suggest evidence of emergence both before and after the earthquake. The long-term emergence estimates based on the age data on coastal terraces from different parts of the archipelago indicate variable uplift rates. Similarly, the coseismic subsidence observed along the eastern margins of middle Andaman seems to be consistent with the continuing trend of subsidence evident from shallow cores. In an effort to address the question on the predecessors of the 2004 earthquake, we have initiated paleoseismological and paleotsunami studies in the near and far field regions; preliminary analysis point to the occurrence of past events. Perhaps, some parts of the subduction front are more prone to large earthquakes (M$\sim$8), but the asperity breaking, megathrust earthquakes are infrequent. Our present studies suggest that the predecessor to the 2004 earthquake may have occurred $\sim$1000 years ago.