Geologic and Geodetic Aspects of the 2004 Sumatra-Andaman Earthquake and 2005 Nias-Simeulue Earthquake

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Abstract

Geologic and geodetic observations, as well as derived models of the co-seismic and post-seismic slip patterns associated with the 26 December 2004 (M 9.2) and 28 March 2005 (M 8.7) earthquakes off Sumatra, are summarized. Geologic data from field observations and satellite imagery analysis contribute a constraint on the 'pivot line' between uplift and submergence of coral reefs, indicating the down-dip rupture extent. Geodetic data from the Global Positioning System (GPS) contribute vector displacements of points on islands along the archipelago, indicating amount and direction of slip along-strike of the rupture. Geodetic and geologic data are sensitive not only to rapid co-seismic fault movement, but also to slower motion across the plate interface that occurs post-seismically. Consequently, the source dimensions and slip pattern estimates based on various geodetic and geologic data differ from purely seismological estimates. A more complete understanding is emerging, based upon joint inversions that use various combinations of all available data, of ways in which sudden and slow slip occurred in each of these two major plate boundary ruptures.

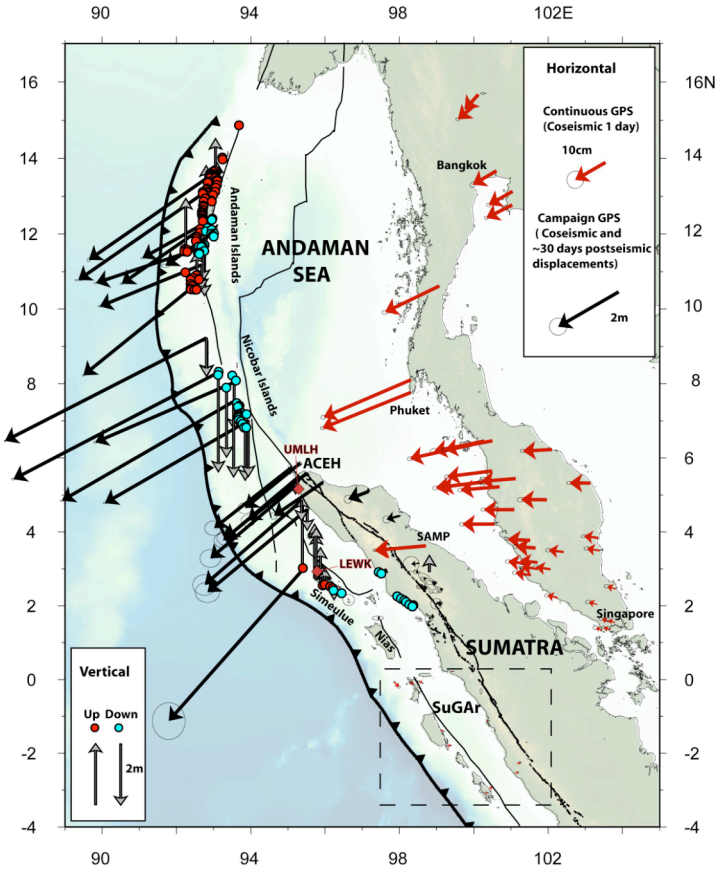

Figure. Summary of all geodetic and geological deformation data for the 2004 Sumatra-Andaman earthquake; red and blue dots summarize data from Meltzner et al. (*JGR*, 2006), red arrows are continuous GPS (e.g., Vigny et al.; *Nature*, 2005) and black arrows are campaign-mode GPS (e.g., Subarya et al.; *Nature*, 2006). Modified from Chlieh et al. (2006; submitted to *BSSA* for special issue).

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