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Evidence of Early Holocene Precursors to the 2004 Sumatra-Andaman Earthquake

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We have collected litho-, bio-, and chronostratigraphic data from the northwest coast of Sumatra to resolve both rapid and gradual changes in relative sea level (RSL). The study sites, in Pulot and Seudu, are located approximately 20 km south of Banda Aceh in northwestern Sumatra. The sites are located on the coastal plain in near proximity to the shoreline. Both study sites are estuarine depositional environments, which are protected from open-ocean wave attack and minimal fluvial input.

To date we have found, at both Pulot and Seudu, evidence of two regionally extensive organic-rich buried soils each overlain by a sand to silty-sand clastic deposit. The buried soils date to ∼7,000 and ∼6,000 cal yr BP and are separated by 1-2 meters of clastic sediment. Each buried soil is interpreted to represent subsidence from a large megathrust earthquake. We present the complete biostratigraphy and estimates of subsidence for the two lower soils at Pulot and Seudu. The dominant mangrove pollen taxon in the organic buried soil at Pulot is Rhizophora, which is replaced by the mangrove taxon Bruguira/Ceriops in the overlying clastic unit. The foraminifera in the clastic deposits represent an inner shelf environment, with taxa including several species of Elphidium, Ammonia, and secondary species including Fissurina sp., Quinqueloculina and Bolivina. The pollen and foraminiferal assemblages at Seudu are similar, but biostratigraphic evidence suggests the dominate taxa lived in environments with higher salinity tolerances than at Pulot, marked by a higher diversity of inner shelf foraminiferal taxa in the clastic unit and more fringing mangrove pollen taxa in the underlying organic-rich soil unit. We hypothesize this to possibly indicate a lower overall paleoelevation or a less protected environment, open to a greater exchange of marine waters. Based on these preliminary identifications of both the foraminifera and pollen, we interpret the organic-rich buried soil hosted a mangrove environment and the overlying clastic unit was deposited in an inner shelf environment, suggesting a coseismic RSL change of 0.7 m.