

Potential Sedimentary Evidence of Two Closely Spaced Tsunamis on the West Coast of Aceh, Indonesia

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Recent research in the coastal regions of Aceh, Indonesia, an area that was largely affected by the 2004 Sumatra Andaman earthquake and ensuing Indian Ocean tsunami, suggests the possibility that two closely spaced tsunamis occurred at the turn of the 14th to 15th century (Meltzner et al., 2010; Sieh et al., 2015). Here, we present evidence of two buried sand layers in the coastal marshes of West Aceh, possibly representing these penultimate predecessors of the 2004 tsunami. We discovered the sand layers in an until recently inaccessible area of a previously studied beach ridge plain about 15 km North of Meulaboh, West Aceh. Here, the 2004 tsunami left a continuous, typically a few cm thick sand sheet in the coastal hinterland in low-lying swales that accumulate organic-rich deposits and separate the sandy beach ridges. In keeping with the long-term progradation of the coastline, older deposits have to be sought after further inland. Using a hand auger, the buried sand layers were discovered in 3 cores in a flooded and highly vegetated swale in about 1 km distance to the shoreline. The pair of sand layers occurs in 70-100 cm depth and overlies 40-60 cm of dark-brown peat that rests on the basal sand of the beach ridge plain. The lower sand layer is only 1-6 cm thick, whereas the upper layer is consistently thicker, measuring 11-17 cm, with 8-14 cm of peat in between sand sheets. Both layers consist of massive, grey, medium sand and include plant fragments. They show very sharp upper and lower boundaries clearly distinguishing them from the surrounding peat and indicating an abrupt depositional event. A previously developed age model for sediments of this beach ridge plain suggest that this pair of layers could indeed correlate to a nearby buried sand sheet interpreted as tsunamigenic and deposited soon after 1290-1400AD (Monecke et al., 2008). The superb preservation at this new site allows the clear distinction of two depositional events, which, based on a first estimate of sedimentation rates, are separated by only a few decades. Future microfossil and grain size analysis as well as radiocarbon dating are necessary to assertively interpret the origin, depositional characteristics and age of the two sand layers.

Meltzner et al. (2010): Coral evidence for earthquake recurrence and an A.D. 1390 – 1455 earthquake cluster at the south end of the 2004 Aceh-Andaman rupture. *J. Geophys. Res.* 115, B10402.

Sieh et al. (2015): Penultimate predecessors of the 2004 Indian Ocean tsunami in Aceh, Sumatra: Stratigraphic, archeological and historical evidence. *J. Geophys. Res. Solid Earth*, 120, 308-325.

Monecke et al. (2008): A 1,000-year sedimentary record of tsunami recurrence in northern Sumatra. *Nature*, 455, 1232-1234.