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A 1000-yr-old tsunami in the Indian Ocean points to greater risk for East Africa

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Maselli et al. (2020) described evidence in Pangani Bay, Tanzania, of a tsunami that they conclude occurred ~1000 years ago. At a depth of ~1.5 m, they found a sand layer, which they interpret as a tsunami deposit, hosting human remains lacking traditional funerary burial. The bones did not present any evidence of disease or trauma due to battle. Radiocarbon dating indicated that the event that deposited the sand layer in Pangani Bay occurred ~1000 years ago. Sedimentary evidence of paleo-tsunami deposits of the same age were reported from 14 sites in Thailand, India, Indonesia, southern Sri Lanka and the Maldives, pointing to an event in ca. A.D. 950.

Although Maselli et al. did not associate the Pangani Bay, Tanzania, inferred tsunami deposit with a historical earthquake, the NOAA Global Historical Tsunami Database (NOAA, 2020) contains an event in Nagapattinam, India, in A.D. 900 based on Rastogi and Jaiswal (2006) who described the event as follows:

"There is mention of tsunami effect in scriptures at Nagapattinam in 900 AD that destroyed a Buddhist monastery. According to literature available in the library of Thondaiman kingdom in Puduckottai, Tamilnadu, it was during the reign of Raja Raja Chola that waves had washed away the monastery and several temples and killed hundreds of people. There is evidence of this in Kalaki Krishnamurty's book *Ponniyin Selvan—The Pinnacle of Sacrifice*, In the chapter 'The Sea Rises', the author explains how the sea had risen very high and the black mountain of water moved forward. The sea inundated warehouses and sheds and began to flow into the streets. Ships and boats seemed suspended in mid-air, precariously poised on the water peaks. The book also describes how an elephant was swallowed by the gushing water."

It seems likely that this is the event that Maselli et al. identified in Pangani Bay, Tanzania. Considering the tsunamigenic earthquake sources that are present in the Indian Ocean (Jaiswal et al., 2008; Schäfer and Friedmann, 2019), it is evident that the Sumatra–Andaman Sea subduction zone is the only one with the potential to generate large transoceanic tsunamis in the Indian Ocean, so we seek evidence in other paleo-tsunami records of large tsunamis in that region to see if the A.D. 900 event is recorded in them.

The A.D. 900 event does not appear on the lists of events inferred to have occurred at sites in Aceh (Rubin et al., 2017) and the Andaman Islands (Malik et al., 2019), but in both cases, it may have occurred at a time when conditions were such that a record would not have been made. In the case of Aceh, Rubin et al. (2017) found evidence for at least 11 prehistoric tsunamis that struck the Aceh coast between 7400 and 2900 years ago, and they state "The cave probably contained stratigraphic evidence of recent historic tsunamis from 2900 years BP to the 2004 Indian Ocean tsunami that have been identified elsewhere in the region, but these were most likely removed by subsequent tsunamis inundating the cave as indicated by the erosional unconformity beneath the 2004 deposit."

In the case of the Andaman Islands, Malik et al. (2019) describe evidence for 7 events between A.D. 1881 and before 5600– 5300 BCE, and state"The sequence includes an unexplained hiatus of two or three millennia ending around 1400 CE, which could be attributed to accelerated erosion due to Relative Sea-Level (RSL) fall at ~3500 BP."

From this, we conclude that the absence of observations of the A.D. 900 event at Aceh and the Andaman Islands does not preclude the likelihood that it occurred somewhere in this region. The association of the A.D. 900 tsunami with tsunami deposits in Tanzania and South Asia enhances our understanding of what appears to be a major historical transoceanic tsunami in the Indian Ocean.

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