

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

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We appreciate Somerville's (2020) interest in our work, and the opportunity to further expand the discussion about the occurrence of a trans-oceanic tsunami in the Indian Ocean generated by a megathrust earthquake ~1000 years ago. Somerville suggests a connection between the inferred tsunami deposit presented by us (Maselli et al., 2020) and a tsunami event reported to have occurred in Nagapattinam (India) in the year 900 CE and described in Kalaki Krishnamurty's book (Rastogi and Jaiswal, 2006).

Cultural and historical observations of past tsunamis, as well as traditional knowledge, are undeniably valuable sources of information that can also be used to guide the selection of field sites. Because of space constraints, we did not include details for each of the 1000-yr-old tsunami deposits described in the literature and presented in our figure 3 (Maselli et al., 2020), which also includes a reference to the 900 CE event (e.g. Ranasinghage, 2010).

The 900 CE event described in Nagapattinam scriptures and pointed out by Somerville has been validated by our collaborators (see Ranasinghage, 2010; Ranasinghage et al., 2010), who noted that there is sedimentological evidence of the 900 CE event preserved in Sri Lanka. These sources also identified sedimentological evidence for an earlier event at ca. 2200 BCE that was described in the Indian epic *Ramayana*. Ranasinghage (2010) noted that there are other instances of ancient coastal flooding described in local scriptures and historical documents from India and Sri Lanka, which could have been due to either tsunami, monsoon-driven fluvial floods, or coastal storm surges. The timing of some of these events, which some view as legends, are vague and difficult to discern, such as an event linked to the reign of Sri Lankan King Tharaka (time of reign unknown), who ruled before King Ravana (2554–2517 BCE).

We agree with Somerville that the absence of sedimentary evidence for a tsunami near 900 CE in Aceh (Indonesia) and in the Andaman Islands (Rubin et al., 2017; Malik et al., 2019) does not preclude the likelihood of its occurrence, as more recent erosional events could have removed the deposit. For example, field studies in Sri Lanka (Moore et al., 2007) and Thailand (Szczuciński, 2012) described the limited

preservation potential of the recent 2004 tsunami deposit due to the erosion generated by subsequent Monsoon rains.

Inferred tsunami deposits ~1000 years old have also been identified along the coastlines of western India (Prizomwala et al., 2018), Iran (Shah-Hosseini et al., 2011), and Oman (Hoffmann et al., 2020). We were conservative in our assessment and did not include these results in our published study, as the origin of the tsunami responsible for these deposits has been attributed to a megathrust earthquake from the Makran subduction zone, a submarine landslide in the Arabian Sea, or a combination of both, and not to an earthquake from the Sumatra-Andaman plate boundary. More research on the origin of these deposits may be warranted given our findings.

In essence, we believe that more work is needed to search for additional evidence of past tsunami deposits along the Indian Ocean coastlines, particularly in East Africa, which could aid in reconciling observed sedimentological records with historical texts and traditional knowledge. Furthermore, these new observations will be critical to understanding major historical trans-oceanic tsunamis in the Indian Ocean, and thus to improve tsunami risk assessments in the surrounding regions.

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