

Geologically recorded historical and prehistoric tsunamis in the Tonankai region

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A coring survey at a coastal lowland in Mie Prefecture exposed 10 sand layers deposited from about 4500 to 500 years ago. The layers are interpreted as tsunami deposits because of the presence of abundant bioclasts of marine organisms such as foraminifers and gastropods, and sedimentary structures common in modern tsunami deposits. At the study site, no substantial seawater inundations and sand depositions have been recorded even for the largest typhoons to ever hit the region. On the other hand, written document tells that the Ansei-Tokai earthquake tsunami (1854 CE) inundated the study site and deposited substantial sand layer. Estimated ages of the youngest three sand layers overlap well with tsunamis in 1498, 1096, and 684 CE. Our results support the hypothesis suggested by archaeological studies that the 684 CE rupture extended farther eastward than the historical record indicates or that another tsunami occurred at some time close to 684 CE. We did not find any sand layers that were definitely correlated with the tsunamis of 1361 and 887 CE, which are thought to have occurred by multi-segment ruptures of the Nankai Trough that includes the segment directly offshore from the study site. If the sand layers found at the study site were deposited by the tsunamis of 1498, 1096, and 684 CE, and if the tsunamis of 1361 and 887 CE did not inundate the study site, the tsunami recurrence interval during the relevant time period was about 400 years. This finding does not support the widely believed hypothesis that earthquakes and tsunamis occur at regular intervals of approximately 100 years in this area. In addition, similar to the historical tsunamis, intervals of geologically recorded prehistoric tsunamis at the study site vary from about 100 to 600 years. The hypothesis of variable recurrence of earthquakes and tsunamis along the Nankai Trough should be tested by future geological and historical studies in unbiased way.

Keywords: tsunami deposit, Nankai Trough, recurrence interval