

Research of tsunami deposit in Toba City, Mie Prefecture, central Japan: Investigating tsunami history along the Nankai Trough

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Understanding of recurrence interval and magnitude of previous inter-plate earthquakes and tsunamis is basic information for reducing future earthquake and tsunami hazards. Inter-plate earthquakes have intervals of tens to hundreds of years, and the recurrence intervals and magnitudes of earthquakes and tsunamis should be evaluated on a long time scale. Tsunami deposits, which can be traced back to prehistoric times, are useful for long-term evaluation of the magnitude and frequency of tsunamis. By correlating the ages of tsunami deposits in multiple regions, the regional extent of past tsunamis can be understood. Detailed measurements of ages of tsunami deposits in stratigraphic records for thousands of years can provide information on the recurrence intervals of tsunamis and their variations in a region. In addition, detailed dating of tsunami deposits allow to correlate the tsunami deposits at the study area with historical documents of earthquakes, geological traces and tsunami deposits in other regions, and to know the magnitude and recurrence interval of past earthquakes and tsunamis along the Nankai Trough. The purpose of this study is to investigate tsunami history in the Tonankai Area of the Nankai Trough. We obtained sediment core samples in Toba City, Mie Prefecture, central Japan by hand coring at 4 sites and mechanical core drilling at 3 sites. The sediment consisted mainly of organic-rich silt, and up to 17 sand layers were intercalated in 6.3 m-long sediment core. These sand layers show following 4 features: (1) containing bioclasts of marine organisms such as foraminifera and bivalves, (2) sharp erosional lower contact of sand layers, (3) normal or inverse grading structure, and (4) parallel lamination and rip-up clast. (1) indicates that grains of the sand layers were supplied from a seashore or seafloor, and (2)–(4) are common in modern onshore tsunami deposits. In addition to these sedimentological features of the sand layers, we interpreted the sand layers as tsunami deposits because there was no significant seawater inundation in the study area even during the Ise Bay typhoon in 1959, which was one of the most severe typhoons ever recorded in the region and caused great damage by storm surges. Based on the radiocarbon dating, the uppermost part of the drill core sample is dated to 552–658 cal yr BP (1292–1398 cal CE) (2σ age range, hereafter the same), and the lowermost part is dated to 6498–6664 cal yr BP. Calendar age just below the uppermost tsunami deposit is 731–908 cal yr BP (1042–1219 cal CE), and age below the third from the top tsunami deposit is 1833–1995 cal yr BP. Therefore, the top three tsunami deposits were deposited after about the first millennium CE, and some of them may be correlated with historical earthquakes and tsunamis.

Keywords: Nankai Trough, tsunami deposits, tsunami history, Mie Prefecture, Tonankai Area