

Ancient Kanto Earthquake before 1703 inferred from coastal lowland deposits

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Kanto Earthquake (KE) is a megathrust earthquake of Sagami trough and its recurrence time is estimated to be 180–400 years. Assuming this, it is reasonable to expect several KEs had been occurred in the historical era; however, no consensus has been made for timing of ancient KEs before 1703.

Difficulty to date ancient KEs stems from two reasons. First reason is geological. KEs had rarely left geomorphological evidence of uplift due to inter-seismic subsidence. Analysis of coastal bench is the most useful to reveal uplift history of a coastal region; however, such a conventional method is not applicable for this region. Second is historical document. Although there are tens of records of ancient devastating earthquakes in this region; however, in the medieval time, the description of damage is limited to that in Kamakura.

Kanagawa prefectural government conducted a series of research for three years to detect tsunami deposits in the coastal region of its territory after the 2011 Tohoku earthquake. Even though tsunami deposit was not detected, we found that the coastal geology consists of inner bay deposit of 6 ka at the bottom overlain by tidal flat and fluvial deposits of historical era (>9c). The boundary between 6ka and historical deposits locates at about the present sea level. We also found that the ages of tidal flat deposit forms 3 groups (18c, 13c and 9c) and older tidal flat deposit were found inland. The ages of the tidal flat deposit seem to close to the timing historical major earthquakes in 1703, 1257 and 1293, and 878.

Tidal flat deposits form in high energy environment and renew frequently by tidal surge and flood. Preservation of such an ephemeral deposit needs departure from high energy environment. We thus consider that the uplifts caused by ancient KEs preserved the tidal flat deposit and cover of fluvial and sand dune deposit, which took place in subaerial environment, protected the deposit from erosion. This study shows that large amount of sampling and dating of coastal lowland could reconstruct uplift history of the region. On the other hand, further studies are needed for geological development of coastal lowland, especially age distribution of samples in a tidal flat deposit.

Reference

Mannen, K., Yoong, K. H., Suzuki, S., Matsushima, Y., Ota, Y., Kain, C. L., & Goff, J. (2017). History of ancient megathrust earthquakes beneath metropolitan Tokyo inferred from coastal lowland deposits. *Sedimentary Geology*. <https://doi.org/10.1016/j.sedgeo.2017.11.014>

Keywords: Kanto Earthquake, megathrust earthquake, tidal flat, Kamakura, Sagami trough, coastal lowland