

Tsunami deposits observed with rice paddy development at Noda village, Iwate Prefecture

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Tsunami-like layers were appeared on drainage channel wall that excavated for rice paddy development at Noda village, Iwate Prefecture. This site located behind the tide embankment (elevation of the embankment top is TP+12m) along the northern part of Sanriku coast. The 2011 Tohoku-oki tsunami was inundated to about 1km inland going over the embankment.

We identified four sand and gravel layers that were distributed continuously in peat buried by surface paddy soil (Event I to Event IV from the top). These layers show a tendency becoming thin and shallow toward inland. Therefore upper layers were mixed in surface soil and disappear. Each layer has an erosional base and consist of one massive unit, however it has no distinct laminae, rip-up mud clasts and grain size grading. We consider each event layer was probably formed by tsunamis because of the distribution and sedimentary structures are similar to tsunami deposits that have been reported in previous studies.

Event II sand is deposited below tephra layers. The distinct tephra layer is identified as Baitoushan-Tomakomai tephra (B-Tm) that was deposited in early to middle 10th Century. Other one can be identified as Towada-a tephra (To-a) of AD915 is observed only in a few points just below the B-Tm tephra layer. Radiocarbon dating results just above and below Event II sand layer is consistent with the tephra chronology. These analytical results suggest Event II sand deposited early to middle 10th Century, therefore Event II is potentially corresponding to 869 Jogan tsunami. Radiocarbon dating results just above and below Event I gravel layer shows 14th Century to early 17th Century. 1611 Keicho Oushu (Sanriku) tsunami is known as one of the historical large tsunamis which recorded damage along the Sanriku coast at this time. It is pointed out that tsunami might have also occurred in 1454 along the Pacific coast of Tohoku district, although there is no definite record.

Radiocarbon dates of lower event layers suggest that each layer deposited 5th Century to 6th Century (EventIII) and 1st Century to 3rd Century (Event IV). Our survey result mean four (five including 2011 Tohoku-oki) inundation of potentially large tsunamis occurred past 2000 years in this site.

Keywords: tsunami deposit, historical tsunami, Jogan tsunami, Keicho Oushu (Sanriku) tsunami, Noda village Iwate Prefecture