

Sedimentary features of the 2011 Tohoku-Oki tsunami deposit and paleo-tsunami history in Numanohama, Sanriku Coast

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We have conducted tsunami deposit surveys in Numanohama marsh in Miyako City, Iwate Prefecture since the summer of 2012. Tsunami deposit from the 2011 Tohoku-Oki earthquake at this site has characteristic facies that contain both marine- and land-origin particles. This facies represents a sequence of tsunami inflow transporting marine sand/pebble and return flow transporting land soil, riverbed pebble and talus deposits. We identified at least 10 event layers from the 5.8 m long column sample; we named these layers as S1 to S10 from the top to the bottom. S10 has a characteristic facies with mixed marine and land particles, similar to the 2011 deposit. Radiocarbon dating (¹⁴C) result shows that S10 deposited from 1800±20 yrBP (calendar year within 2σ range: AD130-320) to 340±30 yrBP (AD1470-1640).

V-shaped valleys are distributed along the Sanriku coast from Miyako to Kuji City. At the survey site, the tsunami height from the 2011 Tohoku-Oki earthquake was 34.1 m (Tsuji *et al.*, 2011). Oguchi *et al.* (2013, Abstracts for the fall meeting of the Association of Japanese Geographers) made detailed geomorphological survey using a laser scanner in Aneyoshi, Miyako City, and showed that tsunami wave eroded land soil and vegetation in valley plain, and lead collapse of rock wall or slope. Sediments eroded by tsunami re-deposit in a valley plain as 'tsunami deposit'. Understanding the characteristic features of tsunami deposit from the 2011 Tohoku-Oki earthquake in a V-shaped valley is useful for identifying paleo-tsunami deposits along the Sanriku coast.

The characteristic feature of the 2011 Tohoku-Oki tsunami deposit could be identified up to 300 m inland from the shoreline. The content ratio of marine pebbles gradually decreases toward inland. On the contrary, riverbed pebbles become rich at upstream sites with a distance of >560 m from the coast. The event layers could be divided into five kinds of particles; A (marine sands/pebbles), B (rock clast from the rock wall), C (riverbed pebbles), D (talus deposits), and E (land soil). Particles A-E are considered to be transported toward inland by tsunami inflow, while a part of these particles were re-transported by return flow. Particles classified into B and D are strongly influenced by return flow and transported by mud or debris flow from the top of small valley. After such a flow joins the main river stream, riverbed pebble were transported further seaward.

We conducted a drilling survey by using handy geo-slicer, observed outcrops and pit at the valley plain to investigate the distribution of each paleo-event layer. In addition to the six layers in our previous study, we identified four additional event layers S7-S10. The ¹⁴C dating revealed that those events occurred during the period from 1950±20yrBP (AD0-AD120) to 410±20yrBP (AD1440-1610). We plan to estimate the depositional ages from more dating samples and to reconstruct paleo environment in this marsh.

Keywords: Tsunami deposit, Sanriku coast, Paleo-tsunami, Historical earthquakes