

Field Survey of Tsunami Deposits in a Reclaimed Lagoon in Minami-Soma City, Fukushima Prefecture

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For the purpose of reconstructing paleo-tsunami histories, we conducted field survey of tsunami deposits at the Idagawa drained land in Odaka district, Minami-Soma City, Fukushima Prefecture in June and November 2014. We set a survey line perpendicular to the coast and obtained 11 core samples of 1.4-2.7 m length at distance ranging 0.6-2.7 km by using handy geo-slicer. We sketched the facies, analyzed grain sizes, and measured the ¹⁴C ages. Tsunami trace of the 2011 Tohoku-oki earthquake covers the rice paddy soil in the drained land with the thickness of 3-30 cm, and it can be observed at the all sampling sites. Six sandy layers including the 2011 tsunami trace were identified in the 2.7 m long core sample obtained at the central part of the drained land. The ¹⁴C age at the lowermost part of the sample was 2,310±20 yr BP, indicating that there are possibly six or more tsunamis attacked the survey area.

Tsunami deposit survey on the Fukushima coast is important to constrain the southern limits of the 869 Jogan and 1611 Keicho tsunami deposits, and northern limit of the 1677 Enpo tsunami deposit. Along the coasts of Sendai plain to Fukushima, paleo-tsunami deposits were reported by previous studies (Sawai *et al.*, 2012, GRL). At the present survey site, three event layers which deposited after 2,820 yrBP were identified in 1.1-1.6 m long core samples by a previous survey (Goto and Aoyama, 2005, Abstracts for the JpGU). The sedimentary features of the 2011 Tohoku-oki tsunami deposit were reported by Oota and Hoyanagi (Proceedings of the 2014 annual meeting of the Geological Society of Japan). The survey site is a former lagoon where a reclamation project started in 1919, and has been utilized for rice paddies until the 2011 Tohoku-oki earthquake. Old maps published in 1910, 1888 and 1821 indicate a lagoon or inner bay facing a coast, which is affected by the tide. It is expected that the paleo-tsunamis transported sandy deposit from coast to the inner part of the bay, which can be distinguished with inner-bay muddy deposit.

The facies of the core sample obtained at the central part of drained land (1.8 km from the coast) can be divided into 11 units from the top to the bottom as follows: 1. Very fine to coarse sand including mud drape and normal grading (thickness ~ 30 cm); 2. Soil for rice paddies including undecomposed plants; 3. Alternative layers of medium sand with lamination and mud clasts; 4. Muddy layer including shell fragment; 5. Fine to medium sand with normal grading and lamination; 6. Muddy layer; 7. Medium sand with normal grading and lamination; 8. Reductive muddy layer with olive yellowish color; 9. Medium sandy layer with normal grading and rich mud clasts; 10. Reductive muddy layer; and 11. Medium to coarse sand layer with normal grading, lamination, and mud clasts. Six sandy layers (1, 3, 5, 7, 9, 11) have sharp basal contacts with the lower units, and can be widely identified at the survey area: hence, they are considered to be event deposits. To estimate the depositional ages, we obtained ¹⁴C ages for wood/shell fragments and charred materials as follows: 1000±20 yrBP (calendar year 2σ: AD1310-1420) from a shell fragment below unit 3, 1660±30 yrBP (AD270-430) from a charred material above unit 5, 1960±20 yrBP (40BC-AD90) from a charred material above unit 9, and 2310±20 yrBP (410BC-260BC) from wood fragment at the lower part of unit 11. Inner-bay muddy deposits below unit 8 contain rich oyster assemblage and shell fragments of Trapezium clam in core samples with the distance <1.2 km from the coast, while their productivity abruptly decreased above unit 5. This indicates that the sedimentary environment changed at the border of unit 5. In future, we plan to reveal the characteristics of deposit and reconstruct the sedimentary environment through the microfossil and elementary analyses as well as careful investigation of samples by increasing the number of samples.

Keywords: Tsunami deposit, Fukushima, Paleo-tsunami, Historical earthquakes