Sodium-titanium ratios in tsunami deposits from the Sendai plain, the Pacific coast of northeastern Japan

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The Sendai plain, northeastern Japan, had severe damages by tsunami after the 2011 off the Pacific coast of Tohoku Earthquake (Mw=9.0). After tsunami invasion, these areas had been covered by huge amount of tsunami deposits [1]. The tsunami deposits contained gravel, sand, mud (silt and clay), and microfossils. On the other hand, past tsunami deposits (for example, Jogan tsunami deposits, ~1000 years ago) can be found from outcrops and boring core samples as visible sandy event layers [2] [3]. The past tsunami deposits in strata are useful indicator to assess possible tsunami invasion area [4]. However, discrimination of past tsunami deposits is still uncertain because muddy tsunami sediments were mixed with land soil. Therefore, geochemical techniques were applied for discrimination of the deposits in this study.

In this study, we performed radiocarbon dating of plant residues, tephra dating and geochemical measurements for continuous soil sediments (HS2-7) from Sendai plain, the Pacific coast of northeastern Japan, taken by handy-geoslicer (Fukken co. ltd.). The soil sediments are 84–183 cm in length, and composed of cultivated surface soils, peaty clay, silt and fine-medium sands. The HS2–HS7 was sub-sampled at 1 cm intervals, and measured for chemical component by EDXRF on the discrete samples. Beside, plant residues were picked up from the samples for radiocarbon dating. In addition, geochemical discrimination of tsunami deposits using Na/Ti atomic ratios were adopted to HS2-HS7 sediment samples. These samples were taken from coastal side (HS2, 3, 4, 7) and inland side (HS5, 6). For the HS7 samples (coastal side), Na/Ti and Si/Al atomic ratios in sandy layers were relative high (up to ~30 and ~7 respectively) in comparison to those of peaty clay layers. On the other hand, relative low Na/Ti atomic ratios in sandy layers (~5-7) were observed for HS6 (inland side). Therefore, these results indicate that Na/Ti could be proxy of past tsunami invasion.

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