

An evaluation flowchart for detection of infrequent gigantic tsunami and the case study in the Wakasa Bay area

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Introduction : We propose an evaluation flowchart for detection of infrequent gigantic tsunami, which rapidly provides accurate and practical solutions applicable to the coastal important installations. We have investigated the tsunami deposit at the coast of the Wakasa Bay in the Sea of Japan, after the 2011 Off the Pacific Coast of Tohoku earthquake. The X-ray CT images of unconsolidated lagoon sediments captured during our case study is effective in facies analysis and enabled us to develop the evaluation flowchart. The objective of the flowchart is gigantic tsunami because tiny ones affect no damage on the coastal important installations. **Philosophy of detection of infrequent gigantic tsunami** : No tsunami deposit has been reported in the Wakasa Bay area. A lack of subduction zone along the coast of the Sea of Japan seems to result in the infrequency of gigantic tsunami generated by mega-earthquakes. Thus, investigation method for tsunami deposits supported by a comparison with descriptions in historical materials such as the way along the Pacific coast may overlook indications of infrequent gigantic tsunami in the study area. The purpose of our investigation is accumulation of information regarding traces of infrequent gigantic tsunami. Objective strata are Holocene and partly Upper Pleistocene. We aim to detect sand layers contained within fine-grained sediments. Sand layers showing synchronous and regional characteristics (Umitsu, 1999) can be used as a common marker (hereafter, a marker sand layer) to be examined whether it is a tsunami deposit which makes a subject of us in view of a possibility of infrequent gigantic tsunami. **Selection of the boring point** : We selected 9 points composed of 5 points in the lake Kugushi and 2 points on neighboring land, each 1 point in the lake Suga and the Nakayama marsh in consideration of continuous sedimentation of fine-grained materials, distribution of beach sand, distance from shoreline, elevation, and path of tsunami. Representativeness of the area in the Wakasa Bay was checked by the commonness of the recent tsunami height and propagation of simulated tsunami. **Sampling** : Soft sediments of bottom of lakes and the marsh were successively sampled using boring machine with advanced thin-wall sampler. **Analyses** : Observation of half-cut cores, and measurements of magnetic susceptibility (using U-channel), wet and dry weight, and color were carried out. Dating (14C) by AMS method and tephra analysis were also carried out. These systematic analyses assist objective judgment on the absence or existence of the marker sand layer. **The judgment** : Sediments are composed of silt in the lake Kugushi and the lake Suga, or organic materials in the Nakayama marsh (upper 2 m portion of each core). There is no marker sand layer at least after Cal AD 240-400 (2 sigma) based on the analyses. We judged that gigantic tsunami accompanied by deposition of marker sand layers did not occur during the period of sedimentation. The result is concordant with the result of interview survey regarding historical tsunami record to priests of Shinto-shrines in the coast of the Wakasa Bay area, who said there had been no record of tsunami since the Heian-period. **Additional examinations** : The X-ray CT analysis of the upper most sections (ca. 1 m depth) of lake sediments clearly shows weak sedimentary structures or trace fossils that are mostly undetectable by naked eye. Despite such capability, no marker sand layer was detected. Detailed discussion can be seen in Tateishi et al. (2012, this session). Although there are no marker sand layers, we further examined nanofossils and diatoms for detection the inflow of seawater into these lakes. Predominance marine nanofossils in specific horizon have not been observed. Much inflow of seawater during short term by gigantic tsunami did not happen. Nanofossil analysis should be indispensable in our flowchart if the marker sand layer was detected.

Keywords: infrequent gigantic tsunami, tsunami deposit, evaluation flowchart, boring core