Exploring the potential of Lake Hamana to hold a long and reliable sedimentary record of paleotsunamis along the Nankai-Suruga Trough

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Abstract

Coastal Lake Hamana is located near the convergent tectonic boundary of the Nankai-Suruga Trough, along which the Philippine Sea slab subducts underneath the Eurasian Plate, giving rise to repeated tsunamigenic megathrust earthquakes (Mw≥8). A good understanding of the earthquake- and tsunami-triggering mechanisms in terms of rupture mode and recurrence pattern in time and space, is crucial in order to better estimate the complexity of seismic risks for the densely populated Enshu-nada coast. Based on existing historical data of paleoseismicity (last ~1300 years), the easternmost segment (Tōkai segment) of the Nankai-Suruga Trough appears to exhibit a seismic gap and is expected to rupture in the near future, causing the next 'Tōkai earthquake'. Studying the sedimentary infill of Lake Hamana may help to fine-tune hazard assessment in the area of interest. Thanks to its extensive accommodation space, the Hamana lake basin is considered to be a good archive for past events. Fieldwork (Oct.-Nov. 2014) comprised a reflection-seismic survey for imaging the lake's stratigraphic features, based on which favourable locations for gravity coring were selected. A systematic sampling of bottom sediments from different sites enables us to evaluate vertical as well as lateral changes in depositional environment, including event deposits generated by tsunamis, tropical storms (typhoons) and slope failures. An important part of the study is dedicated to qualitatively distinguish sedimentary facies of storm deposits from the ones generated by tsunamis, since this is an essential step in correctly assess future hazards. For identification of marine tsunami incursions, a set of sedimentological, geophysical, geochemical and micropaleontological analyses are applied on the cored sequences in a multi-proxy approach. Radionuclide dating provides the necessary timeframe and information on prevailing sedimentation rates. Sites bearing the potential of recording complete and long event histories are sampled with long cores (Oct. 2015) in order to retrieve more information on tsunami recurrence patterns in the study area.