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# A long record of extreme wave events in coastal Lake Hamana, Japan

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Coastal Lake Hamana is located near the convergent tectonic boundary of the Nankai-Suruga Trough, along which the Philippine Sea slab is subducted underneath the Eurasian Plate, giving rise to repeated tsunamigenic megathrust earthquakes (Mw $\geq$ 8). A good understanding of the earthquake- and tsunami-triggering mechanisms is crucial in order to better estimate the complexity of seismic risks. Thanks to its accommodation space, Lake Hamana may represent a good archive for past events, such as tsunamis and tropical storms (typhoons), also referred to as "extreme wave" events. Characteristic event layers, consisting of sediment entrained by these extreme waves and their backwash, are witnesses of past marine incursions. By applying a broad range of surveying methods (reflection-seismic profiling, gravity coring, piston coring), sedimentological analyses (CT-scanning, XRF-scanning, multi-sensor core logging, grain size, microfossils etc.) and dating techniques (210Pb/137Cs, 14C, OSL, tephrochronology), we attempt to trace extreme wave event deposits in a multiproxy approach. Seismic imagery shows a vertical stacking of stronger reflectors, interpreted to be coarser-grained sheets deposited by highly energetic waves. Systematic sampling of lake bottom sediments along a transect from ocean-proximal to ocean-distal sites enables us to evaluate vertical and lateral changes in stratigraphy. Ocean-proximal, we observe a sequence of eight sandy units separated by silty background sediments, up to a depth of 8 m into the lake bottom. These sand layers quickly thin out and become finer-grained land-inward. Seismic-to-core correlations show a good fit between the occurrence of strong reflectors and sandy deposits, hence confirming presumptions based on acoustic imagery alone. Sand-rich intervals typically display a higher magnetic susceptibility, density and stronger X-ray attenuation. However, based on textural and structural differences, we can make the distinction between different types of sand units: i) massive to layered sands with a sharp, erosive lower contact, ii) thin, discontinuous sand lenses with a sharp lower contact and iii) inter-fingered sand-rich and silt-rich intervals with a gradual lower contact. Variability in appearance suggests a variety in triggering events too, going from tsunamis, over storm surges (typhoons) to the impact of sea-level changes on the interaction between tidal delta and lacustrine sedimentation. Preliminary dating (210Pb/137Cs) results in sedimentation rates of $\sim$0.4 cm/yr for the last 100-150 yr. Two closely-spaced tephra layers are tentatively linked with the reported Osawa Fuji scoria (3090 BP) and Kawago-daira pumice (3150 BP). However, more absolute ages (14C and OSL) are essential in order to obtain an accurate age-depth model and to position events in time. We are proceeding with the age determination of event sand beds based on single-grain OSL dating of feldspars. Whereas quartz appeared to be not suitable for dating, research in onshore archives close to Lake Hamana already proved the suitability of the IRSL50 signal of feldspar.