

## Fine-grained sediment gravity flow deposits induced by flood and lake slope failure events: examples of lacustrine varved sediments in Japan

Yoshiro Ishihara (1), Yasunori Sasaki (2), Hana Sasaki (3), and Yuri Onishi (4)

(1) Fukuoka University, Department of Earth System Science, Fukuoka, Japan (ishihara@fukuoka-u.ac.jp), (2) Asano Taiseikiso Engineering Co., Ltd., Osaka, Japan (sasaki-ys@atk-eng.jp), (3) Graduate School of Science, Fukuoka University, Fukuoka, Japan (sasakihana.study@gmail.com), (4) Graduate School of Science, Fukuoka University, Fukuoka, Japan (yur.onishi@gmail.com)

Fine-grained sediment gravity flow deposits induced by flood and lake slope failure events are frequently intercalated in lacustrine successions. When sediment gravity flow deposits are present in varved sediments, it is suggested that they provide valuable information about sediment gravity flows, because they can easily trace laterally and can give the magnitude of erosion and recurrence interval of events. In addition, because large sedimentary bodies of stacked sediment gravity flow deposits in varved sediments of a calm lake are not suggested, a relatively simple depositional environment is expected. In the present study, we analysed sedimentary facies of sediment gravity flow deposits in varved lacustrine diatomites in the Middle Pleistocene Hiruzenbara and Miyajima formations in Japan, and concluded a depositional model of the lacustrine sediment gravity flow deposits.

Varved diatomites: The Hiruzenbara Fm., a dammed lake fill as foots of Hiruzen Volcanos, is deposited during an interglacial period during MIS12 to 15. Varves of ca. 8000 yr were measured in a 20 m intercalating flood and lake slope failure-induced sediment gravity flow deposits. The Miyajima Fm., distributed in a paleo-caldera lake in NE Japan, includes many sediment gravity flow deposits possibly originated from fandeltas around the lake. These formations have differences in their depositional setting; the Hiruzebara Fm. was deposited in a large lake basin, whereas the Miyajima Fm. was deposited in a relatively small basin. Because of the depositional setting, intercalation of volcaniclastics is dominant in the Miyajima Fm.

Lacustrine sediment gravity flow deposits: Sediment gravity flow deposits in both formations can be classified into flood- and lake slope failure-induced types based on the sedimentary facies. Composites of the both types are also found. Flood-induced types comprise fine-grained silts dominated by carbonaceous fragments, whereas lake slope failure-induced types are dominated by rip-up clasts of diatomite. The former is well continued in outcrops; however, the thickness of the latter is changeable and the lower contact is erosive. In the Hirzenbara Fm., flood-induced type includes epiphytic diatom valves as river inflows, whereas slope failure-induced type is composed of diatom valves of varved diatomite.

Flood-induced types are suggested to be classified into hyperpychal flow and hypopychal flow types with regard to the presence of basal erosion. On the other hand, slope failure-induced types can be interpreted as debris flow deposits occurred in the lakes. Differences in the two types are also shown as bed-thickness frequency distributions indicating event magnitude.