Flood-induced sediment gravity-flow deposits in varved diatomites

*Hana Sasaki[1], Yoshiro Ishihara[2]

1. Graduate School of Science, Fukuoka University, 2. Department of Science, Fukuoka University

Based on differences between inflows and lake water, lacustrine sediment gravity-flows induced by floods can classified as hyperpycnal flows along the bottom of lakes, homopycnal flows mixed with lake water, and hypopycnal flows that spread along lake surfaces. Lacustrine sediment gravity-flow deposits that show an inversely grading unit overlain by a normally grading unit have been recognized as hyperpycnites. A depositional model is presented where the lower inversely grading unit is deposited during an increasing phase of the flow followed by the upper normally grading unit overlaying in a decreasing phase of the flow. That process based sedimentary model established in marine environments has been applied to sandy inflow deposits of lakes. However, there are only a few reports of fine-grained hyperpycnites, and there is no consideration of lateral facies changes associated with sediment processes of silty hyperpycnites. Also, there is no observation associated with homopycnites and hypopycnites, although these deposits are expected in a depositional setting, including hyperpycnite. In this study, we described detailed sedimentary facies of hyperpycnite, homopycnite, and hypopycnite from lacustrine varved deposits considering their sedimentary processes. We examined several formations including the Hiruzenbara Formation in Maniwa City, Okayama Prefecture, which can easily be used to define flood- and slope-failure deposits. The formation deposited in the paleo-Hiruzenbara Lake includes varved diatomite with more than 95% fossil diatoms. Therefore, inflow materials can be easily identified in the formation. Fine-grained hyperpycnites identified in this study show a set of normally grading and inversely grading units or a normal grading unit. As previously discussed, it is suggested that these deposits are deposited in an increasing phase of inflow followed by a decreasing phase of inflow. The deposit of a normally grading unit is deposited from a flow completely eroding the lower unit. Due to the occurrence of rip-up clasts, the lower inversely grading unit might erode the lower layer; whereas, the upper normally grading unit is suggested to be dominated by more depositional flows that have a higher organic matter content. Hyperpycnites tend to thin out toward the downstream ward and change their sedimentary facies with the occurrence of rip-up clasts and organic matter. Fine-grained homopycnite and hypopycnite are present as structureless thin deposits of less than 1 mm composed of inflows of fine materials with no erosion. These deposits have lower organic matter content than hyperpycnites and do not include rip-up clasts. It is possible that flows of these deposits mixed with the lake water or were spread along the lake surface, after which the materials slowly settled. Thin fine-grained homopycnites and hypopycnites do not exhibit any sedimentary facies change over several kilometers, except in cases where they are pinched out.

Keywords: lacustrine deposit, sediment gravity-flow deposit, hyperpycnite, homopycnite, hypopycnite, varved diatomite

