Hydraulic environments of Lake Kizaki based on the grain size analysis: Effects for dissolving biogenic silica particles

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In case of measuring grain-size distribution of lake sediment by using laser diffraction size analyser uses a laser light source to measure particles, it is necessary to dissolve autochthonous biogenic particles such as diatom to detect hydraulic information based on grain size characteristics of clastic detritus.

Lake Kizaki is located in the northern part of Ohmachi City, Nagano Prefecture, central Japan. The two cored sediments were sampled at the center of the Lake Kizaki in 2003 and 2005, which are 35 cm and 64 cm long, respectively. The former core was analysed in 0.5 cm intervals and the later was analysed in 1 cm intervals. In this study, we dissolved biogenic silica particles in sediment according the technique proposed by Mortlock and Froelich (1989), and the results of dissolution were checked under microscope. The difference between original sediment and biogenic-silica dissolved sample is examined at first.

The sediments of Lake Kizaki have bi-modal distributions which have peaks around 10 micron and 180 micron except for notable turbidite layer. The finer and coarser modes are referred to the first and second modes, respectively. When the biogenic silica particles are dissolved, the second mode becomes larger than that of original samples, because diatoms forming the first mode are completely lost. Additionally based on the differences of sand-silt-clay ratio and modification of the first mode, dominant species of diatom such as Cyclotella sp., Synedra sp. and Fragilaria sp. can affect the original grain-size distribution.

By dissolving biogenic silica particles, original grain-size characteristics are become clear. They indicate that there exist 2 types of transportation processes, that is, suspension and turbidity current, take place constantly.

The Naka-Nobu River and Inaozawa River flow into Lake Kizaki from north and from east, respectively. These rivers play important role of detritus sediment supply such as turbidity current. There exists one notable turbidite layer which is dated as AD 1961 by Kumon et al.(2004) in the cored sediments. Based on the vertical grain size variability, it seems that moderate turbidity current take place once per every 10 to 20 years and notable turbidity current is once about 50 years.