

Relationship of lithology and sedimentation rate to the recent human activities around Lake Kizaki, central Japan

Takuma Ito[1]; Fujio Kumon[2]

[1] Mountain and Environmental Sci., Shinshu Univ.; [2] Environmental Sci., Shinshu Univ.

1. Geographical features of Lake Kizaki

Lake Kizaki is one of the Nishina three lakes, located in the north of Omachi City, central Japan. The Nishina three lakes are linked by the Nogu rivers, which flows from north to south. Naka-nogu river forms a fluvial plain in the northern end of the lake. Another major river, Inaozawa river flows into the lake from east, and forms a fluvial fans which is used as rice fields now. In this study, we will report human activities have been changed sediment lithology and its sedimentation rate. Lake sediments have preserved environmental changes around the drainage area.

2. Material and method

A 35 cm long of sediment core was sampled in July, 2007 and was cut into 0.25 cm interval. Several turbidites were intercalated in this core. Age model was constructed according to grain size peaks of which turbidites compared with the known flood events. Grain size parameters were determined using COULTER LS230 apparatus. Terrigenous ratio was calculated the weight differences between bulk and chemical processed samples.

3. Results and discussion

3.1. Lithology

Sediment lithology can be divided into 5 facies; Facies 1 (top to 4.0 cm depth) is characterized by massive structure with high water content. Facies 2 (4.0 to 20.0 cm depth) is composed of thinly parallel lamination with continuous boundaries. This parallel lamination is the alternating occurrence of dark- and light-colored bands and its scale is a few millimeter. On the basis of the smear slide observations, the grayish light-colored sediments were mainly consisted of diatoms, on the other hand, dark-colored sediments were composed of terrigenous siliciclastic materials. Facies 3 (20.0 cm to 26.5 cm depth and 28.25 cm to 30.0 cm depth) is characterized by massive structure and by relatively dark color with low water content. Facies 4 (4.0 to 4.5 cm depth, 26.5 cm to 28.25 cm depth, and 31.0 cm to 33.5 cm depth) is characterized by upward-fining coarse-grained sediment. Facies 4 can be interpreted as a turbidite. Facies 5 (30.0 cm to 35.0 cm depth) is massive structure characterized by relatively dark color with low water content.

3.2. Grain size parameters and sedimentation rate

Mean size varies from 5 to 10 microns. Coarse horizons of which mean sizes coarser than 15 micron are recognized in 5 layers, i.e. 12.5 to 15.0 cm, 27.0 to 28.0 cm and 28.25 to 26.5 cm. Those horizons can be able to correspond to turbidite layers.

Terrigenous materials ratio varies between 40 wt% to 80 wt%. Terrigenous materials ratio shows gradually decreasing trend toward upper part of this sediment as a whole.

The age model was determined using known flood events on the basis of grain size analysis. In several grain size peaks, the highest peak from 28.25-26.5 cm in study core was deposited in AD 1961 by catastrophic flood event. The age model was consistent with the result of Cs-137 measurements. Sedimentation rate between AD 1961 and AD 1970 is estimated as 1.3 cm/year, while sedimentation rates from AD 1970 to AD 2007 are quite small, 0.1 cm/year between AD 1970 and AD 1983, 0.2 cm/year between AD 1983 and AD 1995, and 0.3 cm/year between AD 1995 and AD 2007, respectively.

Sedimentation rate and terrigenous ratio start to decrease during 1960s. This fact would reflect the cement bank protection of the lake associated with rapid economic grow in Japan. The terrigenous material ratio decrease in this period due to less erosional processes of lakeshore by wave action. However, terrigenous supply increases as well as sedimentation rate since AD 1982. This fact may reflect the river morphology improved to straight cut and land improvement work on Inaozawa fluvial fan. These events of artificial modification have been changed sedimentation rate and sediment lithology.