

Water Level changes of Lake Biwa, during the last 50,000 years inferred from seismic and sequence stratigraphic analyses

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Seismic profiles of the eastern margin of Lake Biwa were analyzed to reconstruct lake level changes, which were presumed to be affected by changes of water budget, possibly induced by changes of Asian Monsoon. The layers are classified into 10 units, Unit 1, 6 and 10 are characterized by progradational pattern (oblique- and shingled-) that suggests lake regression. Unit 5 shows downstepping pattern that suggests forced regression of the lake. Unit 3, 7 and 9 represent backstepping pattern that suggests lake transgression. Upper boundaries of Unit 6 and 10 are undulated, probably due to erosion.

A drilled core sample called Echigawa-oki Core (EB core), is measured 20.5 m in length was recovered from off the mouth of the Echi River. It consists of rounded gravel (17~m), silty mud (3~17 m) and clayey mud (~3 m), and shows overall fining-up facies succession in ascending order. The middle silty mud contains volcanic glass layers which can be correlated to chronologically well-known tephras as Ulreung-Oki (10.3 ka), Sakate, BT8 and AT (29 ka), in descending order. Eight sedimentary facies are recognized from the EB core. Depositional environments of these facies are, facies A (lake basin floor), facies B, F (prodelta), facies C (flood flowing), facies E (lower delta front), facies D (lower ~upper delta front), facies G (channel) and facies H (flood plain). Sequence stratigraphic study was carried out based on the seismic and sedimentary facies analyses. Sequence 1, consisting of unit 10, is interpreted to have been formed before 46,000 years ago. Sequence 2, from unit 4 to unit 9 was probably formed from 46,000 to 19,000years ago. Sequence 3, from unit 1 to 3 was formed during the last 19,000 years.

Lacustrine shelves and buried shelves are interpreted to have been formed as prograding deltas or alluvial plains at 46 ka, and from 26 to 19 ka. According to the relative lake-level curves reconstructed from long-term lake level history, lake level was continually rising during the last 50,000 years. At the same time, mid-term changes show three cycles, superimposed on to the long term level variation. In addition, short-term variations are also observed.

The long-term changes are likely caused by gradual subsidence of Lake Biwa basin. Mid-term one is possibly caused by the changes of water budget, affected by the monsoonal changes. The short-one was caused by periodical earthquake displacements.