

Subsurface sedimentary structure of Lake Biwa revealed by seismic sub-bottom profiling

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We have investigated detailed records of paleoclimate and earthquake history for the last 50 kyrs by means of seismic profiling and core analysis in Lake Biwa. In the first stage of the project, we constructed digital archive of sub-bottom seismic profiles of Lake Biwa obtained in August 2008. This dataset comprises east-west profiles at intervals of 1 minute in latitude (ca.1.85 km) revealed by 10 kHz seismic survey and DGPS navigation. By referring to sedimentary records of our piston cores and previous bore-hole data, we recognized three distinctive reflectors, corresponding to lithological boundaries of the Kikai-Akahoya (K-Ah, 7.3 ka), Ulrung-Oki (U-Oki, 10.7ka) and Aira-Tn (AT, 26-29 ka) ash layers.

Some of the seismic reflectors were not clearly traced even within a single profile, depending on reflection intensity. We therefore adopted the BS-Horizon (Nonogaki et al., 2008), which utilizes information from the upper and lower strata. We then obtained an isopack map (areal thickness distribution) of the sediments measured above each tephra layers. The sediment thickness above the K-Ah ash increases from the east coast toward the northwest, reaching to 12 m near the center of the lake. The sediment above the U-Oki ash shows a similar tendency. The isopack map referred to the AT ash displays an area with lower accumulation rate extending in NE-SW direction in the eastern part of Lake Biwa.

Temporal and spatial changes of depositional conditions including accumulation rates may represent morphological change of depositional basins or shift of subsidence area associated with activity of the fault system along the west coast of Lake Biwa (the Biwako-Seigan active fault system). Also the depositional process might have been controlled by variation of sediment supply from erosional catchment area, which was possibly related to climate changes. The digital archive of seismic profiles thus provides basic framework for understanding paleoclimate and earthquake history around Lake Biwa.