Paleoclimatic changes based on the density measurement of sediments at the Posolskaya Bank in Lake Baikal

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Lake Baikal in the southeastern Siberia is one of the oldest, deepest and largest lakes in the world. Sediments of Lake Baikal has recorded geologic and climatic changes of the Eurasian continental interior for about 30 million years. This study is based on the result of density measurement of BDP99, taken at the Posolskaya Bank near Selenga delta in Lake Baikal in 1999.

Density of sediment shows good correlation to biogenic silica content (mainly diatom) in Lake Baikal. Sediments in warm period contain many diatom valves. While hemispelagic clayey sediments in cold period contain little diatom valves. Density of sediment is low in warm period, and high in cold period. The density record from Lake Baikal may be one of the proxies which can show global climate changes.

The density of BDP99 varies between 2.38 to 2.74 g/cm3. The result shows cyclic high and low values which are correlative to global climate changes. The low density parts can be observed at about 1 m, 30 m, 35 m, 41 m, 48 m, 50 m and 60 m below lake bottom. The depths of steep change in density profile correspond well with the depths of acoustic reflector. Moreover, many of the depths of reflector can be correlative to those of Marine Isotope Stage boundaries.

As the biogenic silica profile well corresponds to the SPECMAP isotope profile, age model is estimated based on comparison between the BDP99 density profile and SPECMAP chronology. Results of spectral analysis of both the density profile from BDP99 and SPECMAP indicate existence of the spectral maxima of about 18 kyr, 22 kyr, 40 kyr and 100 kyr. These spectral maxima can be observed in Milankovitch cycle. This includes a cycle of 19 kyr and 23 kyr (precession), 41 kyr (orbital tilt), 100 kyr and 410 kyr (eccentricity). The spectral maxima of 18 kyr and 22 kyr of the density record from BDP99 are clearer than those of SPECMAP profile. Therefore, the area of Lake Baikal can be concluded as sensitive to insolation changes for the past 350,000 years.