Paleomagnetic and rockmagnetic studies on Lake Baikal sediments

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In the Baikal drilling project, five long cores have been obtained from Lake Baikal. Here, we present the study of paleomagnetism and rockmagnetism conduced on the BDP96 core of 200m length and BDP98 600m core drilled at the Academician ridge of central part of Baikal.

(1) Magnetostratigraphy and the estimation of sedimentation rate

BDP96 core shows the clear inclination reversal patterns. Comparing them with a geomagnetic polarity time scale, it is found that the core covers to the age of 5 Ma. The upper 277 m of BDP98 can be readily correlated to reference geomagnetic time scale indicating an age to C3An, 2n. The above magnetostratigraphy suggests the fairly constant sedimentation rate of about 4.0 cm/kyr around the Academician ridge during the over 6 Myr.

Below 277 m depth of BDP98 core, it becomes rather difficult to find a reasonable correlation to the reference geomagnetic time scale due to the long reversed interval between 290-352 m depth. The present interpretation shows the core attains a basal age of about 12 Ma at 600 m depth.

(2) Variation of the magnetic susceptibility and paleoenvironment

Variation in the susceptibility of BDP96 and the upper 277 m of BDP98 is closely related to change in diatom contents, dry density, water contents and grain size. Both susceptibility and dry density show the high value during glacial periods and low value during interglacial periods. Whereas diatom content, water content and grain size are high during interglacials and low during glacials. These fluctuations synchronized well with the change in marine oxygen isotope, suggesting that the magnetic susceptibility is a good indicator of global climatic change.

Spectral analyses for the susceptibility show that the periods in the variation are harmonic with the Miankovitch parameters. The periodograms indicate a shift from 100 kyr eccentricity cycle to 41 kyr obliquity cycle in spectral character at 3.0-2.7 Ma and also a shift in spectral character from 41 kyr obliquity cycle to 100 kyr eccentricity cycle at 1.2 Ma. The amplitude of fluctuation in the susceptibility increases since 1.2 Ma and the tendency to increase from 3.0-2.7 Ma in the susceptibility is identified.

The above changes in the magnetic properties may be correlated with the global climate change casused by the event such as, the intensification of Northern Hemisphere glaciation due to the uplift of the Himalaya Mountains and the Rocky Mountains and/or the progressive closing of the Panamanian isthmus, the elevation of the Himalayas and Tibetan Plateau attained above a snow line.