

Paleomagnetic and rock magnetic studies of sediment cores from Lake Biwa off Nagahama

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We performed paleomagnetic and rock magnetic studies of sediment cores of about 8-14 m long (BIW07-3, 4, 5) obtained by piston coring at three sites off Nagahama, the northern part of Lake Biwa, in order to conduct high-resolution analyses of geomagnetic-field and environmental changes for the last 50,000 years. The cores were mainly composed of gray silt to silty clay, including several layers of widespread volcanic ashes, such as Kikai-Akahoya (K-Ah) and Aira-Tn (AT) ashes. Sand layers were found just below AT volcanic ash layer in the BIW07-3 core. A clear color boundary (CCB), indicating a color change from dark gray to dark bluish, was observed at 3.18 m in depth in the BIW07-3 core. A dark gray clay layer (DGCL) was found between 3.33 and 3.38 m in depth in the BIW07-4 core. Judging from the interbedded widespread volcanic ashes, the bottom parts of the cores were dated about 50 ka for BIW07-3, 45 ka for BIW07-4 and 60 ka for BIW07-5. Analyzed samples were continuously obtained by 7 cc plastic cube case.

Judging from magnetic properties in high and low temperature, the principal magnetic minerals in the sediment cores off Nagahama is low-temperature oxidized (magnetized) magnetite. The existence of hematite is also suggested.

Consistent changes in direction of stable magnetic components isolated by progressive alternating-field demagnetization were observed in the parts between 28 and 23 ka of the three cores and were similar to those in the sediment core off Shirahige, the central part of Lake Biwa. The direction change was considered to represent the paleo-secular variation of geomagnetic field between 28 and 23 ka.

Initial magnetic susceptibility (k) values of the three sediment cores off Nagahama showed downward gradual increase as a common trend and spike-like maximums at volcanic ash layers. Additionally, the characteristic minimums were observed at the CCB and DGCL in the BIW07-3 and 4 cores and at 3.62 m in depth in the BIW07-5 core. It was also found that variations of susceptibility of anhysteretic remanent magnetization (k_{ARM}) and k_{ARM}/k in the three cores correspond to each other. An increase (decrease) in the amount of magnetized magnetite was accompanied with a decrease (increase) in its grain size. The general trends of the variations in k_{ARM} and k_{ARM}/k were almost similar among the cores. The variations of k and k_{ARM} in the cores off Nagahama are comparable to those in cores taken from the central part of Lake Biwa. The k and k_{ARM} variations are regarded as common variations in the whole Lake Biwa. Characteristic changes in the variations of k and k_{ARM} may be correlated to the Dansgaard-Oeschger and Younger Dryas events recorded in oxygen isotope ratio of Greenland ice cores.