Magnetic signature of brief interstadial events in Lake Biwa during the past 40 kyres

Akira Hayashida [1], Yoshiki Kuniko [2], Mohammad Ali [3], Masayuki Torii [4], Kazuyoshi Yamada [5], Hitoshi Fukusawa [6], Hiroyuki Kitagawa [7], Keiji Takemura [8]

[1] SERI, Doshisha Univ., [2] Grad. Sch. Human and Environmental Studies, Kyoto Univ., [3] Geoscience Laboratory, GSP, [4] Fac. Info., Okayama Univ. Sci., [5] Geographical Sci., TMU, [6] Dept. of Geography, Tokyo Metropolitan Univ., [7] International Research Center for Japanese Studies, [8] Dept.Geophysics, Grad. Sci., Kyoto Univ.

High-resolution analysis of rock magnetic properties of piston core sediment for the last 40 kyrs from Lake Biwa revealed that the magnetic mineral concentration co-varies with the total organic carbon content (TOC). In particular, the ARM variation from 40 to 30 kyrs BP is well correlated to the Dansgaard-Oeschger cycles recorded in Greenland ice cores. These results suggest that flux of fine grained magnetite and organic carbon were both increased in the post-glacial period and also during the interstadial stages of the Dansgaard-Oeschger cycles, probably associated with greater precipitation around Lake Biwa.

Lake Biwa, situated in the central part of Japan, is a sedimentary basin that can provide continuous record of past environments since the Middle Pleistocene. Although the paleoclimatological data from previous core samples are correlated to major glacial and interglacial cycles during the last 430 kyrs, high-resolution studies on paleoenvironment or paleoclimate have not yet been attained. In 1995, seven piston cores of 10-15 m long were obtained at three localities in the northern part of Lake Biwa. Detailed studies of tephrochronology and AMS radiocarbon dating showed that two piston cores of about 15 m long, which were recovered off Shirahige Cape at a water depth 67 m, cover the time period of the last 40 kyrs. The total organic carbon content (TOC) data from this site show increased value in the post-glacial period, and also mimic millennial-scale climatic variations during the last glacial period. Magnetic mineral concentration, represented by ARM or SIRM intensities, shows a remarkable correlation with the TOC data. In particular, the ARM variation from 40 to 30 kyrs BP is well correlated to the Dansgaard-Oeschger cycles recorded in Greenland ice cores. We interpret that flux of fine grained magnetite and organic carbon were both increased during interstadial periods, probably associated with greater precipitation. These results suggest that there were rapid changes in climate around Lake Biwa in response to the instability of the glacial climate, demonstrating capability of environmental magnetism for studies of environmental change and climatic processes.