Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

MIS007-03 Room: 304 Time: May 24 14:15-14:30

Preliminary results of IODP Expeditions 320 and 321: Magnetostratigraphy and redox-related sediment color change

Toshitsugu Yamazaki[1*], Gary Acton[2], James Channell[3], Helen Evans[4], Christian Ohneiser[5], Carl Richiter[6], Yuhji Yamamoto[7], Margaret Delaney[8], Nikolaus Gussone[9], Ed Hathorne[10], Katsunori Kimoto[11], Ken Sawada[12], Shinya Yamamoto[12], Expedition 320/321 Shipboard Science Party[13]

[1]Geological Survey of Japan, AIST, [2]University of California, Davis, [3]University of Florida, [4]LDEO, Columbia University, [5]University of Otago, [6]University of Louisiana, [7]Kochi University, [8]University of California, Santa Cruz, [9]Universitat Munster, [10]University of Bremen, [11]JAMSTEC, [12]Hokkaido University, [13].

One of the scientific objectives of the PEAT expeditions was to provide a fully integrated and astronomically calibrated bio-, chemo-, and magnetostratigraphy for the Cenozoic at the equator. Results of shipboard paleomagnetic measurements using half-core sections are encouraging for the objective; magnetic polarity sequences of middle Eocene to late Oligocene were well documented at Sites U1331 through U1333. At Sites U1335 through U1338, Miocene to Quaternary magnetostratigraphy was recovered. At Site U1332, the average sedimentation rates range from 3 to 8 m/m.y., and at Site U1333, the mean sedimentation rates reach about 12 m/m.y. in lower Oligocene. The sedimentation rates of Miocene sequences are 20 to 30 m/m.y. Our postcruise studies will include long-term and short-term variability of the geomagnetic field such as a possible relationship between polarity reversal frequency and geomagnetic field intensity, a possibility of orbital modulation of the geomagnetic field, and short polarity intervals (cryptochrons or geomagnetic excursions) that were not documented previously.

Remarkable color changes from brown/pale brown to greenish gray are observed midsection at Sites U1334-U1338. The color change is associated in general with abrupt loss in magnetic susceptibility and intensity of remanent magnetization, and it was difficult to establish shipboard magnetostratigraphy for the "green core" intervals. Dissolved Fe concentrations in pore fluids increase in this zone, and the peaks of dissolved Mn appear just shallower than the dissolved Fe peaks. These observations indicate occurrence of Fe reduction in the greenish zones. The greenish gray coloration occurs in the time interval when each site located near the equator south of about 3 deg. N and sedimentation rates were higher, suggesting that higher organic carbon flux in the equatorial upwelling system is responsible for the intensified microbial Fe reduction. However, the relation between dissolved iron and loss of magnetic signals is not straightforward. At Sites U1334 -U1337, the color change and loss of magnetization coincides very well. At U1338, on the other hand, magnetization has survived in parts of green colored sediments. The brown-to-green color change occurs at about 25 m CSF-A (Hole U1338A), but the loss of magnetization takes place at about 50 m. Interestingly, dissolved iron peaks at about 40m, 215m, and 300m correspond to the zones of well-preserved magnetostratigraphy with stronger remanent intensities at this site, the opposite to be expected. Recent rock magnetic studies of marine sediments taken with ordinary piston-corers revealed that reductive dissolution of magnetites occur widely in an anoxic environment, but the horizon where intensive dissolution starts often does not coincide with the Fe redox boundary.

Keywords: IODP, equatorial Pacific, paleomagnetism, rock magnetism, Fe reduction, magnetostratigraphy