Oral | Symbol S (Solid Earth Sciences) | S-EM Earth's Electromagnetism

[S-EM37_30AM1]Geomagnetism, paleomagnetism and rock magnetism

Convener:*Ataru Sakuraba(Department of Earth and Planetary Science, University of Tokyo), Nobutatsu Mochizuki(Priority Organization for Innovation and Excellence, Kumamoto University), Chair:Ataru Sakuraba(Department of Earth and Planetary Science, University of Tokyo), Yuhji Yamamoto(Center for Advanced Marine Core Research, Kochi University)

Wed. Apr 30, 2014 9:00 AM - 10:45 AM 413 (4F)

This session is open to recent advances in all areas being concerned with geomagnetism, paleomagnetism, rock magnetism, and their applications to geophysical and geological issues. We welcome presentations on geodynamo, present and past geomagnetic behaviors, fundamental rock magnetic properties, and paleoclimatic changes and tectonic processes revealed by magnetic methods.

10:30 AM - 10:45 AM

[SEM37-P01_PG]Environmental rock-magnetism of red clay in the South Pacific Gyre during the Cenozoic: relation with rare-earth content

3-min talk in an oral session

*Takaya SHIMONO[1], Toshitsugu YAMAZAKI[2], Katsuhiko SUZUKI[3] (1.Graduate School of Life and Environmental Sciences, University of Tsukuba, 2.Atmosphere and Ocean Research Institute, The University of Tokyo, 3.Institute for Research on Earth Evolution, Japan Agency for Marine-Earth Science and Technology)

Keywords:Red clay, REY, South Pacific Gyre, Cenozoic, Environmental Magnetism

Red clay occupies ~40% of the global ocean floor. Paleoceanographic and paleomagnetic studies of red clay were limited so far because red clay does not yield microfossils that can be used for precise age estimation and sedimentation rates were extremely low, less than a few meters per million years. However, red clay has attracted interest since Kato et al. (2011) reported that red clay rich in REY (rare-earth elements and yttrium) distributes widely in the Pacific Ocean. Among the cores studied by Kato et al. (2011), especially REY-rich mud (2110 ppm at the maximum) of ~40 m thick occurs below 13.5 m below seafloor (mbsf) at the Deep Sea Drilling Project (DSDP) Site 596 at the western edge of the South Pacific Gyre. However, the core sections have large gaps, and rock- and paleomagnetic studies were not conducted. In 2010, Integrated Ocean Drilling Program (IODP) Expedition 329 Site U1365 occupied at almost the same position as Site 596. Continuous pelagic red clay cores of ~76 m thick was recovered above the basaltic basement of ~100 Ma in age.We conducted an environmental magnetic study using the Site U1365 cores to investigate long-range climatic and paleoceanographic changes during the Cenozoic. We also investigate a relation between magnetic properties and REY of the red clay. On the basis of rock magnetic analyses and transmission electron microscopy, magnetic mineral assemblages are dominated by bacterial magnetites (magnetofossils) throughout the cores (Yamazaki and Shimono, 2013). In the uppermost several meters, terrigenous maghemite probably transported as eolian dust increases. High REY mud (2470 ppm at the maximum) of ~40 m thick occurs below 8 mbsf. The variation pattern of REY constant is similar to that at Site 596. The ages of the Site U1365 cores were transferred from those of Site 596, which is based mainly on a constant Co-flux model at Site 596 (Zhou et al., 1992), by inter-core correlation using magnetic susceptibility and REY variation patterns. Paleomagnetic stratigraphy is available for the uppermost several meters at Site U1365.We discuss a possible relationship between REY content and magnetic properties. The REY peak coincides with a sharp

upward decrease in the ratio of κ_{ARM} to SIRM, which indicates an increase of the mean magnetic grain size and/or an increase in the proportion of detrital to biogenic magnetic mineral component. A peak of REY content occurs just below an interval of high magnetic susceptibility. These characteristics are similar to those of red clay cores near Minami-Torishima (Yamazaki et al., 2014, JpGU). This suggests that the increased REY concentration may have occurred in association with a common paleoceanographic event. Eolian dust supply may have increased since ~30 Ma. The Eocene/Oligocene (E/O) transition (~34 Ma) is known as the time when major ocean gateways (the Drake passage and Tasmanian gateway) opened and the Antarctic Circumpolar Current was formed (Scher and Marting, 2004, 2006; Stickley et al., 2004). The onset and increase of dust supply in the South Pacific may have occurred after this time. Northward movement of Australia continent to an arid region (middle-latitude) may have also contributed an increase of dust supply. Hyeong et al. (2013) suggested that phosphatization on the Mid-Pacific mountains took place between 36 and 12 Ma, and it peaked at the E/O transition. They connected the results to paleo-deepwater circulation. A REY peak occur near the E/O transition at Site U1365, which may be related with the phosphorus budget.