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Magnetic properties of REY rich red clay near Minami-Torishima in the Pacific Ocea

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Red clay accumulates slowly on the seafloor deeper than CCD in mid-latitudes. Paleoceanographic and paleomagnetic studies 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. In this paper, we present magnetic properties of red clay cores obtained from the seafloor near Minami-Torishima during the R/V Kairei KR13-02 cruise. From these cores, extremely high REY contents were reported (Fujimoto et al., 2013, JpGU; Suzuki et al., 2013, JpGU). We will discuss a possible relationship between REY content and magnetic properties.

It is known in red clay that magnetostratigraphy can be established back to only ~3 Ma, and this also holds for the KR13-02 cores. However, noisy but rather coherent inclinations were obtained throughout the cores even where polarity reversal patterns were obscure. Although a possibility that these directions are of magnetic overprint cannot be excluded, the observed inclinations are not much lower than that expected from the GAD model at the present latitude. This may suggest that the sediments including the intervals of high REY content are not very old, possibly Eocene to Oligocene or younger in age, and that they deposited in the northern latitudes not very far from the present sites. This result is not consistent with the idea that the high REY content is influence of hydrothermal activity along the East Pacific Rise. The cores showed a common magnetic susceptibility variation pattern, and a peak of REY content occurs just below an interval of high magnetic susceptibility. The REY peak coincides with a sharp upward decrease in the ratio of 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. These results suggest that the increased REY concentration may have occurred in association with a paleoceanographic event.

Keywords: red clay, REY, rock magnetism, environmental magnetism, Pacific, Minami-Torishima