Paleomagnetic and environmental magnetic records during the last 400 kyrs from sediment cores in the western equatorial Pacific

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It is known that sediments in the West Caroline Basin, western equatorial Pacific, yield high-quality paleomagnetic records (e.g., Yamazaki and Ioka, 1994), and paleointensity variations during the last 3 m.y. were reported (Yamazaki and Oda, 2005). A coring proposal was submitted to IODP in order to recover geomagnetic field behavior during the last 10 m.y. using sediments in this region (Proposal #612-Full3, Yamazaki et al., 2006). A site survey for the proposal was conducted during the R/V Kairei KR05-15 cruise, and four piston cores of 15 to 20m long were taken along a depth transect from about 3200 to 4300m in depth. High-quality relative paleointensity records were obtained from the four cores. The records are almost identical each other, which enables precise correlation among the cores. The cores cover the last 400 to 600 kyrs. Based on the inter-core correlation using the paleointensity, it was shown that inclination variations agree well each other. The occurrence of long-term secular variations in inclination on the order of 10 to 100 kyr and correlation between paleointensity and inclination variations are recognized, as suggested by Yamazaki and Oda (2002). The mean inclination anomaly during the Brunhes Chron from 12 sites in the West Caroline Basin including the four cores of this study is -6.1 degree (+-2.7). Available time-averaged field models generally show that the western equatorial Pacific is an area of large inclination anomalies.

It is also known that the pattern of magnetic susceptibility variations closely resemble the oxygen-isotope curve in sediment cores from West Caroline Basin, and ages of the cores were estimated based on the correlation between the two. However, the correlation is not necessarily well-grounded because the previous cores were taken at depths near the CCD, about 4000m or more, and no high-quality oxygen-isotope curves were obtained from the cores. In this study, the core KR0515-PC1 was taken at 3226m in depth, well above the CCD, and oxygen-isotope ratios were measured. The results confirmed that the magnetic susceptibility variations can be correlated with the oxygen-isotope curve without time-lag. An interesting observation is that the magnetic susceptibility variations at the three sites shallower than about 3800m in depth are more close to the insolation curve (in summer at 65N) and the frequency of the precession is conspicuous, whereas the variations at the site of about 4300m deep (core KR0515-PC4) are close to the oxygen-isotope curve and the period of about 100 kyrs is remarkable. Moreover, the precession frequency is obvious in the records of a magnetic grain-size proxy at all four sites. The main source of the sediments in the West Caroline Basin is inferred to be detritus from the New Guinea Island, and the magnetic property variations would reflect paleoclimatic changes in the equatorial Pacific.