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100-kyr quasi-period in sedimentary paleointensity records: Towards discrimination of geomagnetic signals and rock-magnetic contamination

T. Yamazaki (1), Y. Yokoyama (2), T. Kanamatsu (3) and H. Oda (1)

(1) Geological Survey of Japan, AIST, (2) Okayama University of Science, (3) JAMSTEC (toshi-yamazaki@aist.go.jp)

Since the late 90s, a possibility on the orbital modulation of the geomagnetic field has been suggested based on the Milankovitch frequencies found in paleointensity records: ~41 kyr obliquity frequency (Channell et al., 1998), and ~100 kyr eccentricity frequency (Yamazaki, 1999; Yokoyama and Yamazaki, 2000; Thouveny et al., 2004; Yamazaki and Oda, 2005). An argument against the orbital modulation of the paleointensity is that it could be an artifact caused by paleoclimatically induced magnetic-property changes of sediments. If variations of magnetic properties of sediments such as magnetic grain size and mineralogy contain the orbital periodicities and show significant coherence with paleointensity changes, this suggests possible contamination of magnetic property changes to paleointensity records (Guyodo et al., 2000). However, this cannot exclude the possibility of orbital modulation of paleointensity, because magnetic properties and paleointensity can also have coherence if the orbital parameters affect both the geomagnetic field and depositional environments. Responses of sediment lithologies to paleoclimatic changes vary place to place, and this would also apply to magnetic properties: for example, magnetic grain size would increase in a certain period of time in some areas, but in other areas it would decrease in the same period of time. We consider that rock-magnetic contamination can be evaluated by detailed comparison of paleointensity records from sediments of various lithologies. It is important to examine phase relationships as well as coherences between paleointensity and magnetic properties of sediments. Our comparison of magnetic properties and relative paleointensities between siliceous clay cores in the North Pacific and hemipelagic clay cores off New Guinea suggests that rock-magnetic contamination to paleointensity is small, if any.