

Recent progress in paleo- and rock magnetism and its applications produced by IODP

YAMAZAKI, Toshitsugu^{1*}

¹AORI, University of Tokyo

Paleomagnetists have sailed most of the IODP expeditions, and greatly contributed to the achievement of the aims of individual expeditions. At the beginning of the new phase of IODP, I will review progress in paleomagnetism and rock magnetism and their applications produced by IODP for the last about 10 years.

Results of the two IODP coring programs, one in the North Atlantic (Exp. 303/306) and the other in the east equatorial Pacific (Exp. 320/321), greatly improved our understanding of the past geomagnetic field variations. High-resolution paleointensity records during the Pleistocene with precise age control were obtained from North Atlantic drift sediments. These records led the establishment of the PISO-1500 paleointensity stack, which is now used as the standard curve for paleointensity-assisted chronostratigraphy. Detailed records of polarity reversals and excursions were also obtained. From the equatorial Pacific sediment cores, continuous Miocene to Eocene relative paleointensity records were obtained for the first time, although resolution is not high. Previously, continuous paleointensity records were available only for the last ca. 3 m.y. No discernible relation between paleointensity and polarity length was recognized, despite that a weak positive correlation was suggested previously. On the other hand, volcanic rocks from seamounts (Exp. 330) and oceanic plateau (Exp. 324) were utilized for obtaining absolute paleointensity in the Mesozoic.

Rock- and paleomagnetism was applied to resolve various geological and geophysical problems in IODP. First of all, paleomagnetism contributed progress in the mantle dynamics; paleomagnetic inclinations revealed that the Louisville hotspot did not move in concert with the Hawaiian hotspot (Exp. 330), which is known to have shifted southward about 15 degrees between about 80 and 50 Ma. Magnetic techniques such as the anisotropy of magnetic susceptibility were successfully utilized for studying subduction zone dynamics (NanTroSEIZE, CRIPS). Rock magnetic techniques become widely used in paleoceanographic and paleoenvironmental applications. It was recently revealed using IODP cores that biogenic magnetite prevails in marine sediments (e.g., Exp. 320/321 and 329). Its role to remanent magnetization acquisition processes and potential applications to paleoceanography are attracted attention.

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