Magnetostratigraphy and Rock Magnetism Study of Hole U1524A from IODP Expedition 374

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IODP Expedition 374 aims at resolving the Ross Sea ice sheet history since the Miocene. Hole U1524A is cored ~120 km north of the Ross Sea continental shelf edge. The sediments retrieved from this site are composed of 34 cores with a total length of 282 m, providing important materials to reconstruct the ice sheet variability and corresponding driving forces. To determine the age of the cores of U1524A, U-channel samples were taken from the top 8 cores and discrete cube samples were taken from the rest of cores. The natural remanent magnetization (NRM) of the samples are AF-demagnetized up in order to determine the characteristic remanent magnetization (ChRM) upon which the magnetostratigraphy of the cores is built. NRM of the majority of samples can be effectively demagnetized up to 80 mT. It is observed that most samples carry a pronounced component of NRM at the low coercivity range (< 10 mT), which is considered as overprint (either from the recent geomagnetic field or induced by drilling). ChRM can often be defined after removing overprints for samples above Core 18 (156 m core depth below seafloor). Defining the ChRM at greater depth is more difficult because the remaining NRM is weak in amplitude and noisy in direction. We performed rock magnetic experiments to understand the causes for the low quality of data, which revealed two reasons. Firstly, low NRM intensity is related to the decrease in the concentration of magnetic minerals. From Core 23, the concentration is so little that the NRM intensity is close to the instrumental noise level. Thus, ChRM is subjected to measurement noise after overprint (about 30~60% of the total NRM) is removed. Secondly, weak ChRM could be further contaminated by artificial remanence obtained by magnetic minerals with very low coercivity upon demagnetization. Especially with this potential contamination, paleomagnetic results of weakly magnetized samples are often suspicious. We attempted to use a new approach to correct the ChRM of weak samples for contamination in order to extract the geomagnetic information from noisy data. With reliable ChRMs, three major normal/reversed polarity sequences are identified from the sedimentary sequence (up to the bottom of Core 30), which suggests the bottom of Core 30 was deposited in the Mammoth Subchrons that is about 3.3 Ma ago. The sedimentary sequence is thus continuous except for potentially a few short hiatuses. The magnetostratigraphy of Site U1524A of this study is overall in agreement with the shipboard results. The downhole variation in magnetic properties will also be discussed for its environmental implications.