Paleomagnetism around the Cretaceous-Paleogene boundary in the Pacific red clay

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Red clay covers a large portion of the Pacific seafloor. These sediments are expected to be good targets for paleomagnetic and environmental magnetic studies, because magnetic minerals in the oxic environment are not affected by reductive diagenesis. However, paleomagnetic data from red clay are often not straightforward, sometimes attributed to oxic diagenesis. More fundamentally, absolute dating of red clay is difficult, and correlation with polarity timescale remains a challenge. In this presentation, we use newly discovered the Cretaceous-Paleogene (K-Pg) boundary in the red clay around the Minamitorishima Island as a tie-point, and discuss the paleomagnetic data from the sediment. This area has been studied intensively, and we have recovered 71 piston cores (~15 m each). The K-Pg boundary was identified in multiple cores by the age constraints from deep sea agglutinated foraminifera, detailed Iridium measurements, and correlation using magnetic susceptibility. We conducted alternating field and thermal demagnetization on two cores. Both methods yielded characteristic remanence, and polarity patterns consistent between the cores were obtained. Lithological observation and chemical mapping revealed sub-horizontal layering, suggesting minor perturbation due to bioturbation or hiatus. The bottom of the core was estimated to be Late Campanian, while the sedimentation rate in the Cretaceous was estimated to be ~1.5 mm/kyr. The successful magnetostratigraphy in the Mesozoic red clay suggests that oxic diagenesis is not the major factor preventing paleomagnetism. Further studies may constrain the paleogeography of the Pacific plate at around the K-Pg boundary. Besides, the Campanian age at ~15 m depth suggests major hiatus somewhere in the Cenozoic. Indeed, acoustic survey showed that the sediment thickness around the Minamitorishima Island varies significantly. These observations imply that Mesozoic red clay can be recovered from wide area by piston coring or multiple short drillings rather than expensive deep drilling, if one carefully conduct geophysical surveys.

