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11:15〜11:30

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Different contributions to paleomagnetic signals subjected to diagenesis: Overlooked hematite vs. overstated magnetic inclusions

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Diagenesis is ubiquitous in marine sediments, causing sedimentary iron-bearing minerals to undergo a series of redox reactions until they reach equilibrium with reactive chemical components in sediments. Paleomagnetic records in sediments subjected to severe diagenesis may be distorted or lost due to iron mineral dissolution. Some magnetic minerals like silicate-hosted magnetic inclusions can survive the diagenetic iron mineral dissolution and are widely found in marine sediments. Hematite is known as high coercivity mineral and is more resistive to reductive diagenesis compared to other common magnetic minerals (e.g., magnetite). Thus, those minerals provide the possibility of preserving paleomagnetic records in sediments subjected to reductive diagenesis. To better understand this issue, we studied on a sediment core from the Ontong Java Plateau, western equatorial Pacific Ocean. Rock magnetic measurements indicate that severe diagenetic iron-mineral dissolution occurred below about 6 m in depth in the studied sediments, where natural remanent magnetization (NRM) intensity is about 10% of that above 6 m. However, information on paleomagnetic declination and paleointensity could still be recovered. To characterize the mineral composition of the remanence carrier in the reduced sediments, a series of well-designed techniques were applied on selected samples from different phases of diagenesis. Silicate-hosted magnetic inclusions were separated from bulk sediments by chemical procedures. They contribute about 50% or more of saturation isothermal remanent magnetization (SIRM) in the reduced sediments but they possess a relatively low NRM acquisition efficiency as indicated by grain size analysis. High coercivity hematite was identified as another major remanence carrier in the reduced sediments from rock magnetic measurements including IRM decomposition. The presence of hematite is further confirmed by conducting stepwise thermal demagnetization of three-component IRM on bulk samples from the reduced sediments.