Changes in source of lithogenic particles in the Ryukyu forearc region revealed from rock-magnetic properties

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Knowledge of source of sediment particles is key to understand the evolution of sedimentary environment and ocean circulation. Rock-magnetic parameters can be used as a sensitive proxy of source of sediment particles, especially lithogenic particles. In this study we conducted systematic rock-magnetic measurements of sediment sample in the Ryukyu forearc region, to reveal the changes in sedimentary environment and ocean circulation in the region.

Sediment core GH08-2004 was collected at the Ryukyu forearc region using a gravity corer during the GH08 cruise of R/V Hakurei Maru No.2. The sedimentation rate of the core was 3.2-15.6 cm/kyr and the age of the core bottom was estimated as approximately 26 ka (Amano and Itaki, 2016). Dried samples were used in a suite of rock-magnetic measurements. Using MicroMag 2900 alternating gradient magnetometer (AGM, Princeton Measurements Corporation), we conducted measurements of magnetic hysteresis parameters (coercivity B_c, saturation magnetization M_s, saturation remanent magnetization M_{rs}, and coercivity of remanence B_{cr}), isothermal remanence (IRM) acquisition curves, and first-order reversal curves (FORCs). We also measured low-temperature remanence curves using an MPMS-XL magnetic property measurement system (MPMS, Quantum Design): a thermal demagnetization curve during zero-field warming (ZFW) from 10 K to 300K for IRM imparted at 10 K in a field of 2.5 T after zero-field cooling from 300 K (ZFC remanence); a thermal demagnetization curve during ZFW from 10 K to 300K for remanence given by field cooling from 300 K to 10 K in a field of 2.5 T (FC remanence); and a low-temperature demagnetization curve for saturation IRM imparted at 300 K in a field of 2.5 T.

The ratio $J_{ZFC}(10)/J_{FC}(10)$ is lower than 1.4 from 26 ka to 14 ka while it increases to 1.6-2.0 after 13 ka, where $J_{ZFC}(10)$ and $J_{FC}(10)$ are intensities of ZFC remanence and FC remanence at 10 K, respectively. The samples during 26 to 14 ka show the Verwey transition of Ti-poor titanomagnetite in the low-temperature measurements, whereas the transition is unclear for the sample during 13 to 0 ka. The ratio M_{rs}/M_s slightly varies in 0.13-0.19 during 26 to 14 ka, and it gradually increases from 0.14 to 0.24 after 13 ka. These results suggest that source of lithogenic particles during 26 to 14 ka and 13 to 0 ka were different for each other, and it gradually changed from 13 to 0 ka. Taking into account the results of IRM acquisition curves and FORCs, we will discuss the changes in sedimentary environment and ocean circulation in the Ryukyu forearc region.