丹沢複合深成岩体の道志ハンレイ岩中から分離した斜長石粒子の古地磁気・岩石磁気研究

Paleo- and rock-magnetic study on single plagioclase grains separated from the Doshi gabbro in the Tanzawa plutonic complex

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Data of the long-term variation of the geomagnetic field is essential for revealing the thermal evolution of the Earth. To explore the history of the deep Earth using paleomagnetism, it is crucial to understand the average strength of the geomagnetic field for the latest geologic era (e.g. ~ 5 Ma) as a reference point. Several previous studies made estimates by averaging for millions of years, but those estimates have large variations and have not reached to a consensus. In this study, we aim to estimate the average paleointensity using plutonic rocks which are expected to be recording the averaged field strength over their long cooling period.

Measurements were conducted on single plagioclase grains separated from the Doshi gabbro (5 Ma) in the Tanzawa plutonic complex. The bulk samples yielded paleomagnetic direction of reversed polarity, which suggest that the magnetic record has not been overprinted by the recent field. Tiny opaque minerals were recognized in the plagioclase grains under an optical microscope: the minerals are likely to be exsolved titanomagnetite phase. Previous studies indicate that titanomagnetite exsolution in plagioclase exhibits non-interacting single domain state behavior and therefore can be a reliable recorder of the geomagnetic field. However, attention should be paid to the large remanence anisotropy and the high efficiency of remanence acquisition.
We performed a series of rock-magnetic measurements on the single grain samples. The Verwey transition at ~120 K and the Curie temperature >565 ^{o}C suggest that the dominant magnetic carrier is titanium-poor titanomagnetite. Stepwise alternating field demagnetization of the natural remanent magnetization (NRM) showed one or two components. The high coercivity (>50 mT) component was linear and heading to the origin so that could be regarded as the primary magnetization. The median destructive fields were 55–75 mT, 50–60 mT, and 30–40 mT for NRM, anhysteretic remanent magnetization (ARM), and isothermal remanent magnetization, respectively. Anisotropy of ARM acquisition experiments indicated that the distortion by anisotropy on the paleomagnetic record would not be severe but should be treated with care in paleointensity experiments. In the presentation, the results of preliminary paleointensity experiments will also be discussed.

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