Preliminary paleomagnetic study on single plagioclase crystals separated from the anorthositic dike in the Doshi gabbroic body

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In order to explore the long-term variation of geomagnetic field paleointensity, studies on plutonic rocks are considered to be suitable since they are likely to record the time-averaged field during their cooling history. We performed a paleomagnetic study on single silicate crystals separated from the plutonic rocks. We measured the intensity of natural remanent magnetization (NRM) of samples from four sites, including the Doshi gabbroic body, Tanzawa tonalitic pluton, central Japan (DOS03D and DOS21D) and the Pankenushi gabbroic complex, Hidaka magmatic belt, central Hokkaido (95100104 and 95092407B). The DOS03D was collected at central part of the Doshi gabbroic body, while the DOS21D was sampled from the anorthositic dike in the Doshi gabbroic body. The sampling site of 95100104 was located at the east margin of the Pankenushi gabbroic complex, and the 952407B was sampled from the felsic vein in the Pankenushi gabbroic complex. The zircon U-Pb ages in the Doshi gabbroic body and the Pankenushi gabbroic complex were reported as ~5 Ma and ~18.5 Ma, respectively. In cases of the Pankenushi gabbroic complex samples, four out of 30 for 95092407B and four out of 20 for 95100104 had larger NRM intensity than the detection limit of the SQUID magnetometer (2G Enterprises Model 755-4.2 cm). Because 47 out of 58 for DOS03D and 79 out of 80 for DOS21D showed larger NRM intensity than the detection limit, we further conducted stepwise alternating field demagnetization on these samples. At relatively high coercivity range, a linear component heading to the origin was recognized in eight out of ten samples of DOS21D. We consider this component as the primary magnetization. We could not detect such linear component in any samples of DOS03D. We selected five samples of DOS21D and conducted paleointensity experiments using the double heating technique of the Shaw method with low-temperature demagnetization (LTD-DHT Shaw method). The result show that no sample passed the sample selection criteria for reliable paleointensity determinations mainly due to the weak anhysteretic remanent magnetization. Alternately, we tried to calculate paleointensity using the ratio of thermoremanent magnetization at the first heating to that at the second heating in the LTD-DHT Shaw paleointensity experiment. The obtained paleointensity was significantly stronger than the averaged paleointensity data during 4.5–5 Ma reported by previous studies on volcanic rocks.

Keywords: Paleointensity, Single plagioclase crystals, Plutonic rocks

