Examination on natural remanent magnetization and its origin of single grains extracted from the Ito pyroclastic flow deposits

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There are many widespread tephras around Japan and various earth science studies on them have been carried out. In paleomagnetic and rock magnetic studies, measurements are typically done on an assemblage of tephra grains and thus targets are macroscopic remanent magnetization. However, there seems a possibility that an individual grain acquired thermoremanent magnetization (TRM) as natural remanent magnetization (NRM) during its formation at eruption producing the tephras. In this study, we have extracted 20-30 mesh size (595-841 micro-m) grains from unwelded parts of the Ito pyroclastic flow deposits and performed paleomagnetic and rock magnetic measurements to examine origin of the NRM.
NRM intensity measurements were conducted on 646 grains extracted from the Ito pyroclastic flow deposits. These grains could be classified into six different groups: block-type volcanic glass, pumice-type volcanic glass, black rock fragment, green rock fragments, pyroxene, and feldspar or quartz. Seventy-nine grains (12.2%) showed intensities more than 10 times higher than averages of blank measurements (8-17 $pAm^{2)}$. One or two grains were selected from the six groups and subjected to stepwise alternating field demagnetization (AFD) experiments. The experiments revealed that the grains from the groups of block-type volcanic glass, pumice-type volcanic glass, black rock fragment, and green rock fragment have stable remanent magnetization. Rock magnetic measurements were conducted for these grains and they indicated that main remanence carriers of the stable magnetization are single domain magnetites with high coercivity.
The grains with stable remanent magnetization also showed stable behaviors against stepwise AFD of anhysteretic remanent magnetization (ARM) and isothermal remanent magnetization (IRM). Excepting some samples, cases ratios of NRM/ARM and NRM/IRM resulted in 1.24-4.07 and 0.024-0.0475, respectively. These values agree with the ratios of TRM/ARM with 2.60+/-1.32 and TRM/IRM with 0.0362+/-0.0128 reported by Yu (2010) for SD and PSD magnetites at a one standard deviation level, suggesting that NRMs of these grains are TRMs in origin.

