Geophysical Research Abstracts
Vol. 19, EGU2017-3244, 2017
EGU General Assembly 2017

Variation of magnetic anisotropy with coercivity in rocks with multiple remanence carriers, as shown by anisotropy of remanence experiments

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Magnetic fabrics are a powerful tool to assess preferred mineral orientations in rocks, in particular when it is known which mineral(s) carry the anisotropy, and the anisotropy is dominated by one single phase. However, such straightforward interpretations are rare and become increasingly challenging when several anisotropic minerals are present, because their contributions can add up or cancel each other out, leading to complex fabrics. Numerous methods have been developed to separate the paramagnetic, diamagnetic, and ferromagnetic contributions to anisotropy, and anisotropy of remanence measurements specifically allow to isolate the anisotropy of remanence-carrying ferromagnetic grains.

Here, we investigate the anisotropy of anhysteretic remanent magnetization (AARM) and anisotropy of isothermal remanent magnetization (AIRM) in rocks from layered intrusions, which possess a broad range of coercivity spectra and multiple remanence carriers. The goal of this study is to determine how the AARMs and AIRMs, applied to activate different coercivities, vary within the same rocks, and whether it is possible to separate low- and high-coercivity fractions based on AARM and AIRM experiments. Initial results show that for some samples, grains in the coercivity range between 0 – 20 mT display the strongest anisotropy while the anisotropy degree gradually decreases in higher coercivity ranges (20 – 50 mT, 50 – 100 mT, 100 – 180 mT). In other samples, both the degree of anisotropy and the orientation of the principal axes appear to be independent of coercivity. A third group possesses anisotropy in some but not all coercivity ranges. Comparing these results with rock magnetic experiments will help determine which minerals/coercivity fractions contribute to or dominate the whole-rock anisotropy. Coercivity is a function of mineralogy and grain size, and therefore, an understanding of the different behaviors observed in these experiments may help to improve future interpretations of magnetic fabrics and better resolve geodynamic processes in more detail.