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Towards a more detailed understanding of magnetic anisotropy of ferromagnetic grains

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Magnetic fabrics provide information on the preferred alignment of minerals in rocks. The preferred orientation of ferromagnetic grains specifically can be described by various kinds of remanence anisotropy and partial remanence anisotropy, or isolated from high-field anisotropy of magnetic susceptibility (HF-AMS) measurements. This contribution focuses on comparing results from anisotropy of (partial) anhysteretic remanent magnetization (A(p)ARM), anisotropy of (partial) isothermal remanence (A(p)IRM), anisotropy of (partial) thermal remanence (A(p)TRM), and isolated ferromagnetic sub-fabrics from HF-AMS. Experiments were performed on a collection of igneous, metamorphic and sedimentary rocks. A(p)ARMs and A(p)IRMs can be strongly coercivity-dependent, both in terms of principal directions and in the degree and shape of the anisotropy, indicating different fabrics of different grain sizes. Additionally, remanence anisotropy and the ferromagnetic fabrics from HF-AMS can be largely different, indicating that the large MD grains dominating AMS have different fabrics than those of the smaller remanence-carrying grains. These results indicate that a given sample may display a range of magnetic anisotropy that depend on the experimental parameters and the grains targeted in any specific experiment. Hence, measuring ferromagnetic fabrics with a variety of methods provides a more detailed insight into preferred orientations of sub-populations of ferromagnetic grains. Researchers can use these results to determine the ferromagnetic anisotropy most relevant to their specific applications.