AREM: A user friendly toolbox for calculating anisotropy of magnetic remanence

Martin Chadima¹,²

¹Agico, Ltd., Brno, Czechia (chadima@agico.cz)
²Institute of Geology of the Czech Academy of Sciences, Prague, Czechia

A growing interest in isolating ferromagnetic fabric, i.e. magnetic fabric carried solely by ferromagnetic (sensu lato) grains, creates a need for optimization of laboratory protocols used to acquire the array of magnetic remanence vectors necessary to calculate the anisotropy of magnetic remanence (AMR) tensors. Before a laborious and tedious process of measuring large sample collections, several aspects shall be experimentally assessed, namely: (1) what type of magnetic remanence should be applied (e.g. isothermal, anhysteretic), (2) how magnetizing fields (AC and DC) control the acquired magnetization and its anisotropy, (3) how the viscous decay influences the measured remanence, and (4) how many and which magnetizing directions are necessary to obtain reliable and statistically sound AMR tensors. A careful examination of these factors considerably influences the quality of acquired AMR data. To facilitate the AMR tensor calculation, we present AREM – a simple and user-friendly toolbox embedded into Anisoft software. Prior to the tensor calculation, AREM provides a graphical visualization of a set of measured remanence vectors as spherical projections of unit vectors compared to the respective magnetizing directions and their intensity compared to the intensity of demagnetized state (background magnetization). The correction for the background magnetization is optionally done by a direct subtraction of measured background or by a mutual subtraction of antipodally magnetized vectors, if available. The AMR tensor is fitted by a least-square algorithm using a set of pre-selected full-vectors (full-vector method) or their projections to their magnetized directions (projection method). The calculated AMR tensors, including their confidence limits, can be immediately reviewed and processed using all features of the Anisoft software.