# Recent advances in anisotropy of magnetic remanence

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A very effective means of rock fabric analysis is based on the measurements of anisotropic magnetic properties, most commonly magnetic susceptibility. While anisotropy of magnetic susceptibility (AMS) is very fast and precise, it may, in certain cases, possess some disadvantages compared to the methods based on the magnetic remanence. The main applications of anisotropy of magnetic remanence (AMR) are i) distinguishing between the whole-rock magnetic fabric and magnetic fabric carried solely by ferromagnetic (s.l.) minerals, ii) identifying inverse AMS fabric carried by single-domain magnetite grains; iii) assessment how the preferred orientation of ferromagnetic minerals affects the characteristic remanent magnetization of a rock. This short course will deal with the practical aspects of data acquisition, processing and interpretation of AMR with the help of recent instruments and software.

All methods that measure the AMR require a laboratory magnetization – the most common being anhysteretic and isothermal remanent magnetizations – to be imparted along a set of known directions. An anhysteretic magnetization is acquired from the relatively weak DC bias field superimposed on the AC field of gradually decreasing amplitude. Due to limits of commercially available instruments, an anhysteretic magnetization can be only imparted to minerals with low coercivity, such as magnetite. It is also possible to impart a partial anhysteretic magnetization to a particular coercivity fraction, e.g., to single-domain or multi-domain magnetite. An isothermal magnetization is imparted in DC field which may be relative strong.

Even though many sets of magnetizing directions have been proposed, the current hardware/software solution provided by Agico, Inc. (LDA-3/AMU-1 AF demagnetizer/magnetizer in conjunction with a JR-6 series spinner magnetometer controlled by *Arem2W* software) includes 3-, 6-, 12-, and 15-position designs. A specimen is demagnetized and magnetizer in a pre-set field and direction and the imparted magnetization is measured. When all positions are measured, AMR tensor is calculated and displayed as the principal AMR directions (together with respective confidence ellipses) and various quantitative AMR parameters. From now on, the AMR data can be treated the same way as the AMS data and processed using, e.g., Anisoft software. During the

course the practical examples of the simulated measurements using *Arem2W* software will be given. The real examples demonstrating how the AMR can be used in distinguishing the normal vs. inverse fabrics in volcanic dikes will be presented.