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Anisotropy of susceptibility in rocks that are magnetically non-linear even in weak fields

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Theory of the low-field anisotropy of magnetic susceptibility (AMS) assumes a linear relationship between magnetization and magnetizing field, resulting in field-independent susceptibility. This is valid for diamagnetic and paramagnetic minerals by definition and also for pure magnetite, while in titanomagnetite, pyrrhotite and hematite the susceptibility may be clearly field-dependent even in low fields used in common AMS meters. Consequently, the use of the contemporary AMS theory is fully legitimate in the former minerals, but in principle incorrect in the latter ones.

We developed a technique for automated measurement of susceptibility in 320 directions in variable low fields using the KLY5 Kappabridge equipped with a special 3D rotator. In addition, a method for constructing contours of the measured directional susceptibilities on the equal-area projection was developed as well as a procedure for statistical testing that enables us to reveal whether the maxima and minima in susceptibility remain in more or less constant position or move. For the former case, a new method was developed for "linearization" of the data resulting in the determination of the field-independent second-rank tensor. In the latter case, it is necessary to resign on the second-rank tensor representation of the field-dependent AMS and only presentation of the directional susceptibilities in the contour diagrams on the equal-area projection is possible.