Assessment of inhomogeneity of remanent magnetization by measurements with a magneto-impedance spinner magnetometer

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A new version of spinner magnetometer using magneto-impedance (MI) sensor was developed which has a wider dynamic range (10^{-1} to 10^{-6} mAm^2) and a tunable low-pass filter with two (6 Hz and 20 Hz) cut-off frequencies. These new functions allowed the measurement of the fundamental signal (5 Hz) plus the second- (10 Hz) and third-order harmonics (15 Hz). To test how the multipole moments affect the measured waveforms, we measured a set of synthetic samples to simulate the off-centered dipole by changing their direction and offset. The results agreed well with the theoretical waveforms calculated by the offset dipole models. For comparison these synthetic samples were also measured with a conventional, fluxgate spinner magnetometer. It turned out that there are small but significant differences between the results from the two spinner magnetometers. We consider the possible causes for these inconsistencies in terms of theory and instrumentation, and propose the advantage of the MI spinner that can detect the presence and effect of the multipole moment, especially for the case where it is equivalent in the first approximation to the offset dipole model.

Keywords: spinner magnetometer, inhomogeneity of remanent magnetization, multipole moment

