Geophysical Research Abstracts
Vol. 18, EGU2016-3424, 2016
EGU General Assembly 2016

Three-dimensional magnetization vector inversion for high-susceptibility magnetic anomaly

Shuang Liu and Xiangyun Hu

Hubei Subsurface Multi-scale Imaging Key Laboratory, Institute of Geophysics and Geomatics, China University of Geosciences, Wuhan, China (laushua@foxmail.com)

It was meaningful to recover the distributions of total magnetization vector (TMV) since of which the intensity and direction are distorted by the self-demagnetization. We evaluated and compared three approaches of three-dimensional magnetization vector inversion (MVI): (1) simultaneously inverting the TMV's three orthogonal components (MMM); (2) the magnitude, inclination and declination (MID); (3) orderly inverting the magnetization intensity, inclination and declination based on the transformed magnitude magnetic anomaly (M-ID). The primary implementation of MVI was to establish the symmetric positive definite matrix equations on the corrections of the model parameters and observed data sets. Then the optimal solutions were iteratively computed by use of the preconditioned conjugate gradient algorithm. We used the synthetic and real data sets to test these methods and the tests revealed that the isochronous MMM inversion aggravated the geophysical non-uniqueness problem and MID performed low stability of convergence due to the strong dependence on the starting models. While the sequential M-ID showed superior stability and precision of inverting the magnetization intensity and direction by making successive use of the amplitude and phase information of the magnetic anomaly. Finally, the achieved TMV distributions were used to investigate the influence of self-demagnetization and to recover the high susceptibility distributions when the self-demagnetization effect was not negligible.