Geophysical Research Abstracts
Vol. 21, EGU2019-10858, 2019
EGU General Assembly 2019

Poisson's theorem for a combined analysis of gravity and magnetic anomalies, independent on the total magnetization direction.

Andrea Barone (1,2) and Maurizio Fedi (1)

(1) University of Naples "Federico II", Naples, Italy (andrea.barone2@unina.it), (2) National Research Council (CNR) – Institute for Electromagnetic Sensing of the Environment (IREA), Naples, Italy

The Poisson's relation is a useful tool to study the density and magnetization distribution in the Earth. Based on the mathematical similarities between the directional derivative of the gravity field and the magnetic fields, this relation allows to retrieve the magnetization-to-density ratio through a combined analysis of the measured anomalies. Currently, the Poisson's relation is exploited by comparing the pseudogravity-transformed magnetic anomalies and the gravity anomaly, or by considering the reduced to the pole magnetic data and the first-order vertical derivative of the gravity field. Unfortunately, both the approaches require the knowledge about the source total-magnetization parameters, which are crucial information to perform correctly the pseudogravity and the reduction to the pole procedures. Remanent magnetization features are rarely available, and so they are assumed to be equal to those related to the total induced magnetic field. This assumption can lead to wrong interpretations of the analyzed dataset.

So, we here propose other applications of this relation by using different magnetic field transformations. In particular, we use and compare the total gradient and the module of the magnetic field with the second- and first-order vertical derivatives of the gravity data, respectively. This approach is simpler because both the proposed transformations are mostly independent from the remanent magnetization direction.

First, we perform several synthetic tests by considering the procedure proposed by Chandler et al., (2001), employing a moving-data window in order to perform a multisource analysis; the best window size is chosen according to these simulations.

Then, we analyze the anomalies related to several seamounts in the Tyrrhenian Sea. Since these volcanic edifices are not always characterized by structural homogeneity, we restrict the analysis to its homogeneous sub-parts. Finally, we retrieve the magnetization contrast values for the analyzed seamounts by considering suitable density contrast values.