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Lithospheric magnetic potential and pseudogravity from new high-resolution magnetic data compilations

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EMAG2v3 and other global compilation grids depict lithospheric total field magnetic anomalies. Use of satellite derived long wavelengths and improved models of secular and diurnal variation has significantly improved the fidelity and accuracy of global anomaly grids. These new grids offer new opportunities for constructing derivative grids that facilitate further understanding of the magnetic composition of the lithosphere.
Magnetic potential and pseudogravity are two alternative transformations of the magnetic field that can facilitate tectonic and structural analysis. Some researchers use these two terms interchangeably, but there are theoretical and practical differences to the two transformations. As a practical matter it is rather easy to calculate the magnetic potential but full transformation to pseudogravity is more difficult. Pseudogravity has long been recognized (in fact since 1957) as a particularly desirable transformation for use in potential field modeling and interpretation. To date this transformation is usually performed on grids with limited spatial extent and the calculations are performed in the frequency domain with significant limitations, particularly in regions close to the magnetic equator.
In this presentation, we discuss the nature of these two transformations and show the results of direct calculation of the magnetic potential and pseudogravity in the spherical harmonic domain. To our knowledge our efforts represent the first globally consistent results and, in any case, they are the first to be accomplished at high resolution based on the most recent total field anomaly grids.