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Initial review of magnetic features of the lithosphere as revealed in new global magnetic potential and pseudogravity grids

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Globally consistent and accurate grids of lithospheric total field magnetic anomalies (e.g., EMAG2v3) allow for global mapping of geologically and tectonically significant features such as oceanic ridges, transforms, oceanic age bands, igneous provinces, rifts, cratonic regions, etc. The dipole character of total field anomalies creates some complexities for interpretation, especially at low latitudes relative to the magnetic equator. Transformation of total field anomalies to magnetic potential and to pseudogravity offers long recognized (e.g., Baranov, 1957) benefits for ease of interpretation. However, logistical and theoretical difficulties have hindered construction of these transformations on a global scale. We utilize calculations in the spherical harmonic domain to obtain global grids of magnetic potential and pseudogravity. The development of these new grids is discussed in a companion presentation.

This presentation focusses on the global magnetic anomaly patterns and features revealed in these new grids. A primary, first-order feature of the transformed magnetic anomaly patterns is the systematically increasing intensity and wavelength of anomalies ranging from young oceanic lithosphere, older oceanic lithosphere, younger continental lithosphere, to oldest (cratonic) continental lithosphere. The broadest and most intense magnetic potential/pseudogravity features are associated with cratons, most notably the Laurentian Superior, Southern Greenland, and Baltica regions. A distinctive class of intense isolated magnetic highs are associated globally with LIP regions including, notably, the Deccan and Siberian Traps, the High Arctic LIP, and the Central Atlantic Magmatic Province. In addition to such interpretations and analog comparisons by spatial association and inspection, the new global grids offer significant utility as regional context to more localized and analytical studies. For example, the area, calculated volume of magnetic material, and other anomaly features can be compared from region to region based on a consistent global base.