ESTIMATING THE DEPTH-EXTENT OF CRUSTAL MAGNETIC SOURCES FROM AN IMPROVED AEROMAGNETIC COMPILATION OF THE WESTERN U.S.

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We revisit the problem of using aeromagnetic data to assess depth to the Curie-temperature isotherm in the western United States, assumed to correspond to the depth-extent of crustal magnetic sources. The depth to the bottom of magnetic sources is estimated by assuming that crustal magnetization is a layer of random magnetization with a fractal power spectrum. With these assumptions, the shape of the theoretical power spectrum depends on three independent parameters (Maus et al., 1997): the depths to the top and bottom of the magnetic source layer, and the fractal parameter β, characterizing the slope of the power spectrum of the magnetization. We estimate the depth to the bottom of magnetic sources within a window moved across the region. For each window, we first calculate the azimuthally-averaged power spectrum of the magnetic anomalies and then search for the set of parameters that provides the best theoretical fit. This method was first validated on synthetic datasets and then applied to newly-released aeromagnetic compilations for North America and the conterminous U.S. The resulting maps of the depth extent of magnetic sources show long-wavelength, robust features that display correlations with prominent heat-flow anomalies and with the spatial distribution of volcanic rocks. The North American aeromagnetic compilation (NAMAG, 2002) has been obtained by merging a large number of surveys acquired with different specifications and may include artifacts such as offsets at survey boundaries. For this reason, long wavelengths, which contain information on the depth-extent of magnetic sources, are not well constrained in this compilation. We therefore use an improved aeromagnetic compilation for the conterminous U.S. (Ravat et al., 2008) incorporating reprocessed NURE data, which are a homogenous set of low-altitude surveys acquired over the entire conterminous U.S. and provide a better representation of the long-wavelength magnetic anomalies in the 50-500 km range critical for this analysis.

Magnetic anomalies, Curie-temperature isotherm, spectral analysis

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