A FULL SPECTRUM MAGNETIC ANOMALY DATABASE OF THE UNITED STATES WITH IMPROVED LONG WAVELENGTHS FOR STUDYING CONTINENTAL DYNAMICS

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An improved magnetic anomaly database useful for modeling upper lithospheric structure of the conterminous United States has been prepared. The long-wavelengths (50-2500 km) in this new database have been corrected by utilizing a nearly homogeneous set of National Uranium Resource Evaluation (NURE) magnetic surveys flown from 1975 to 1981. The surveys were flown in quadrangles of 2° of longitude by 1° of latitude with E-W flight-lines spaced 4.8 to 9.6 km, N-S tie-lines variably spaced, and a nominal terrain clearance of 122 m. Many of these surveys used base-station magnetometers to remove external field variations. NURE surveys were originally processed with IGRF core-field models, which left behind non- uniform residual trends in the data and discontinuities at survey boundaries. In this study, in place of the IGRF/DGRF, we used a spatially and temporally continuous model of the magnetic field known as the Comprehensive Model (CM, Sabaka et al., 2002), which made it possible to avoid discontinuities at survey boundaries. The CM simultaneously models the core magnetic field and long-wavelength ionospheric and magnetospheric fields, along with their induced components in the earth. Because of the availability of base-stations for removing external fields, we removed only the core-derived geomagnetic field based on CM4 (spherical harmonic degree 13) for our compilation. The NURE data have short-wavelength (less than 30 km) noise due to cultural sources, base-station offsets, and residual external field effects. Therefore, the full spectrum magnetic anomaly database has been created by combining short-wavelength magnetic anomalies from the NAMAM and long-wavelength anomalies from the NURE database using a Gaussian filter centered at 50-km wavelength. This magnetic database for the U.S. is useful for analyzing geodynamic aspects of the crustal and mantle magnetic field that require precise long-wavelength information; e.g., estimating Curie-temperature depths and constraining lithospheric temperatures. Preliminary studies show that the corrected long-wavelength components in this database lead to more realistic Curie depths for the average western U.S. crust. Variation of these Curie depths will allow us to constrain crustal temperatures useful in geodynamic modeling.

Magnetic Anomalies, USA, thermal structure

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