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On estimating high-degree crustal field models using Spherical Harmonic Transforms

Nils Olsen(1) and Terence J. Sabaka(2)

(1) Danish National Space Center, Juliane Maries Vej 30, DK 2100 Copenhagen OE, nio@spacecenter.dk, (2) Geodynamics Branch, GSFC/NASA

Estimating Spherical Harmonic models of the crustal field by Least-Squares fit to the observations is very slow and computer ressources expensive if expansion coefficients of degree larger than $n = 100$ or so are derived. In order to describe small-scale features of the crustal field, several alternatives to global spherical harmonic models, like *Rectangular Harmonic Analysis* and *Spherical Cap Harmonic Analysis*, are therefore in use. Inherent to most of these regional methods are, however, inaccuracies when performing external/internal field separation and upward/downwnard field continuation.

A global spherical harmonic expansion does not suffer from these problems (since its basis functions, the spherical harmonics, solve the Laplace equation). An alternative to the very time consuming fit of the raw observations is an iterative approach, based on a *Spherical Harmonic Transform*. Iterations are needed to account for different altitudes of the observation points.

We will report on some experiments to derive crustal field models up to degree $n = 900$ using this approach. The results could be of interest in for the World Digital Magnetic Anomaly Map (WDMAM), and for regional crustal field resolution enhancement of the *Comprehensive Model*.