CM5, a pre-Swarm comprehensive geomagnetic field model derived from over 12 yr of CHAMP, Ørsted, SAC-C and observatory data

A comprehensive magnetic field model named CM5 has been derived from CHAMP, Orsted and SAC-C satellite and observatory hourly-means data from 2000 August to 2013 January using the Swarm Level-2 Comprehensive Inversion (CI) algorithm. Swarm is a recently launched constellation of three satellites to map the Earth's magnetic field. The CI technique includes several interesting features such as the bias mitigation scheme known as Selective Infinite Variance Weighting (SIVW), a new treatment for attitude error in satellite vector measurements, and the inclusion of 3-D conductivity for ionospheric induction. SIVW has allowed for a much improved lithospheric field recovery over CM4 by exploiting CHAMP along-track difference data yielding resolution levels up to spherical harmonic degree 107, and has allowed for the successful extraction of the oceanic $M_2$ tidal magnetic field from quiet, nightside data. The 3-D induction now captures anomalous Solar-quiet features in coastal observatory daily records. CM5 provides a satisfactory, continuous description of the major magnetic fields in the near-Earth region over this time span, and its lithospheric, ionospheric and oceanic $M_2$ tidal constituents may be used as validation tools for future Swarm Level-2 products coming from the CI algorithm and other dedicated product algorithms.

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