Geophysical Research Abstracts
Vol. 13, EGU2011-2528, 2011
EGU General Assembly 2011

The Limits of Magnetic Field Resolution at the Core-Mantle Boundary

Jeremy Bloxham (1) and Veronika Soukhovitskaya (2)

(1) Harvard University, Cambridge MA,, United States (jeremy_bloxham@harvard.edu), (2) Lawrence Berkeley National Laboratory, Berkeley CA, United States

Recent studies of the short-period secular variation highlight the importance of understanding the limits of resolution of the magnetic field at the core-mantle boundary in both the spatial and temporal domains. Here we use satellite data from the Oersted and CHAMP missions spanning almost a decade to examine this issue.

In the spatial domain we argue that the resolution of the magnetic field at the core-mantle boundary is inhomogeneous. Using a localized estimator of the power spectrum of the magnetic field, we show that the crustal field power spectrum (at degrees up to around 200) is an order of magnitude smaller over oceans than over continental regions, corresponding to a difference in spatial resolution of the core field of about two spherical harmonic degrees.

In the temporal domain the resolution is limited chiefly by two factors: first, the presence of fields of external origin in the observations, and second by mantle electrical conductivity. The former can be alleviated, in part, by a combination of careful data selection and appropriate modeling of external fields, while the later can be assessed through the use of independent datasets, such as length-of-day observations.

We examine also the consistency of our magnetic field model (which does not incorporate any observatory data) with observations from magnetic observatories.