Geophysical Research Abstracts
Vol. 15, EGU2013-3001, 2013
EGU General Assembly 2013

Geomagnetic inverse problem and data assimilation: a progress report

Julien Aubert and Alexandre Fournier
IPG Paris, PARIS cedex 05, France (aubert@ipgp.fr)

In this presentation I will present two studies recently undertaken by our group in an effort to bring the benefits of data assimilation to the study of Earth's magnetic field and the dynamics of its liquid iron core, where the geodynamo operates. In a first part I will focus on the geomagnetic inverse problem, which attempts to recover the fluid flow in the core from the temporal variation of the magnetic field (known as the secular variation). Geomagnetic data can be downward continued from the surface of the Earth down to the core-mantle boundary, but not further below, since the core is an electrical conductor. Historically, solutions to the geomagnetic inverse problem in such a sparsely observed system were thus found only for flow immediately below the core mantle boundary. We have recently shown that combining a numerical model of the geodynamo together with magnetic observations, through the use of Kalman filtering, now allows to present solutions for flow throughout the core. In a second part, I will present synthetic tests of sequential geomagnetic data assimilation aiming at evaluating the range at which the future of the geodynamo can be predicted, and our corresponding prospects to refine the current geomagnetic predictions.

Fournier, Aubert, Thébault: Inference on core surface flow from observations and 3-D dynamo modelling, Geophys. J. Int. 186, 118-136, 2011, doi: 10.1111/j.1365-246X.2011.05037.x

Aubert, Fournier: Inferring internal properties of Earth's core dynamics and their evolution from surface observations and a numerical geodynamo model, Nonlinear Proc. Geoph. 18, 657-674, 2011, doi:10.5194/npg-18-657-2011

Aubert: Flow throughout the Earth's core inverted from geomagnetic observations and numerical dynamo models, Geophys. J. Int., 2012, doi: 10.1093/gji/ggs051