Inverse modelling of the geodynamo

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Geomagnetic data assimilation is an emerging discipline in solid Earth sciences, aiming at optimally combining geomagnetic data with dynamical numerical models of the geodynamo. Geomagnetic data have dramatically increased in quality in the last decade, and the puzzling features of Earth's temporal magnetic variation now calls for refined numerical models, able to reproduce their gross details in a forward modelling approach. Such numerical models are now starting to emerge, and the next step is to formulate a sound framework for geomagnetic data assimilation.

A first step in this direction is the formulation of a static inverse problem, relying on statistics from Earth-like numerical dynamos as prior information for the inversion. This poster presents the recent progresses made by our group in the formulation of such a framework. The existence of parametrised models of Earth's geomagnetic field with reliable error statistics back to 1840 make possible to invert for the dynamical structures which have been present in the Earth's core, where the geodynamo resides, over the last 170 years. The main dynamical structures observed will also be discussed in this poster.