

How does the mantle influence magnetic field reversals?

Master internship proposal 2021

Tutors: H-C. Nataf & N. Schaeffer (ISTerre) and S. Labrosse (ENS Lyon)

We propose to reassess the long-standing question of the role of the mantle on the frequency of magnetic reversals. Can the variations in space and time of the heat flux extracted from the core by the mantle explain the observed variability of geomagnetic field reversals?

Recent geodynamo simulations (Schaeffer et al, 2017) reveal a strong-magnetic field Earth-like regime, which had not been achieved before. Meanwhile, mantle convection simulations yield unprecedented match of plate-tectonic related features (Coltice & Shephard, 2018).

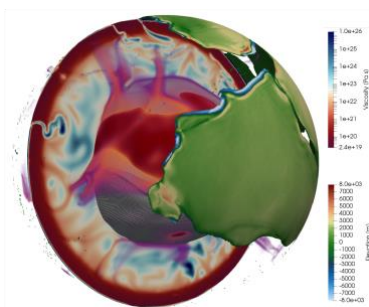
The intern will first extract statistically dominant temperature distributions at the core-mantle boundary (CMB), for instance using Principal Components Analysis tools, from the most recent mantle convection simulations. He/she will then run geodynamo simulations, with imposed heat fluxes derived from the previous analyses. This will allow assessing the impact of various CMB heat fluxes on magnetic field reversals.

The internship can take place either at ISTerre (Grenoble) or at ENS Lyon. In either case, an important interaction with the tutors from both labs is expected. This internship is part of project “RevEarth”, funded by the ANR and could be pursued into a PhD project (funding secured).

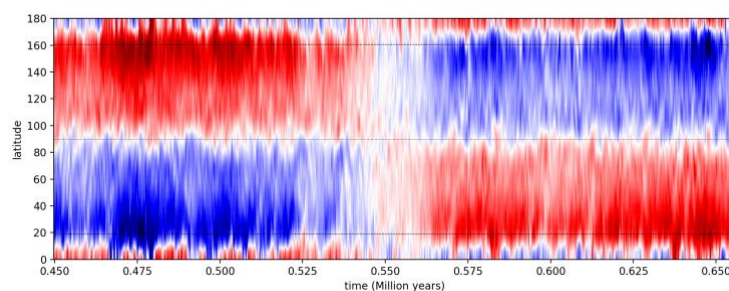
References:

Schaeffer N., D. Jault, H-C. Nataf & A. Fournier, Turbulent geodynamo simulations: a leap towards the Earth’s core, *Geophys. J. Int.*, **211**, 2017.

Coltice N. & G. E. Shephard, Tectonic predictions with mantle convection models, *Geophys. J. Int.*, **213**, 2018.



Temperature structure in a numerical simulation of mantle dynamics. © Nicolas Coltice, 2018.



Magnetic reversal in a geodynamo simulation: radial component of the surface magnetic field. © Nathanaël Schaeffer, 2019.