Title : Dynamics in Earth’s core from interannual to millenial time-scales

Laboratoire : ISTerre (Grenoble)

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level : Master

duration: 4-6 months

key words : geomagnetism, core dynamics

summary : Geomagnetic records from satellites, observatories, historical and archeological samples show that the geomagnetic field presents fluctuations over a broad range of time-scales, ranging from a few years to millenia. Recent advances in numerical simulations of the geodynamo allow to reach parameters that approach Earth-like conditions [1, 2]. A closer analysis of such simulations will help isolate the physics responsible for the observed variations. In particular Magneto-Coriolis modes (influenced by the rotation and Lorentz forces) have been recently discovered on interannual time-scales [3]. They should populate the spectrum over a broad range of periods and are believed to play a significant role in the observed magnetic changes.

The goal of the internship is to analyze geodynamo simulations, by searching for modes in order to establish empirically their dispersion relation. From the waveform of these modes, it can be envisioned to recover the background magnetic field that sustains them. This analysis will put some bounds on our ability to reconstruct the field deep in the core from magnetic records at hand.

We look for a candidate with some background in (geo)physics, applied mathematics or computer sciences. He/she will work in close collaboration with members of the geodynamo team of ISTerre.

references:

[1] Schaeffer, Jault, Nataf & Fournier, Turbulent geodynamo simulations: a leap towards Earth’s core, *Geophys. J. Int.* 211 (1), 1-29 (2017)

[2] Aubert & Gillet, The interplay of fast waves and slow convection in geodynamo simulations nearing Earth’s core conditions, *Geophys. J. Int. 225*(3), 1854-1873 (2021)

[3] Gerick, Jault & Noir, Fast Quasi-Geostrophic Magneto-Coriolis Modes in the Earth's Core. *Geophys. Res. Lett. 48*(4), e2020GL090803 (2021)