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On the role of boundary layer instabilities in core dynamics

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Turbulence in the Earth's core is rather singular. The combined constraints of rotation and magnetic field on the flow severely limit and shape velocity fluctuations. We observe these constraints in the magnetostrophic *DTS* experiment, which consists of a rotating spherical Couette flow in an axial dipolar magnetic field. Fluctuations only reach a few percents of the mean flow (Brito et al, 2011). The frequency spectra reveal peaks, which correspond to modes of different azimuthal wavenumber *m* (Schmitt et al, 2008). We have run 3D numerical simulations of the experiment, which display similar spectra when computed from long time series. This particular wave turbulence is dominantly fed by instabilities of the outer boundary layer. Fluctuations are thus weaker when global rotation is present, because the boundary layer is changed from a Bodewadt layer to an Ekman layer, which is less unstable.

In the Earth's core, the outer Ekman-Hartmann layer is predicted to be close to instability (Desjardins et al, 2001). We expect that it should be even more unstable if the core-mantle boundary is rough. We will discuss to which extent velocity fluctuations in the core could be triggered by boundary layer instabilities at the core-mantle boundary.

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