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Mean zonal flow driven by precession in planetary cores: numerical simulations with a semi-lagrangian scheme

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We revisit the generation of mean zonal flows in fluid planetary interiors subjected to precession. The main effect of precession on a (nearly) spherical fluid envelope is to make the fluid rotate along an axis tilted with respect to the rotation axis of the solid mantle. This is the so-called "spin-over" response of the fluid.
also shows that a steady shear flow develops on top of the spin-over mode due to non-linear effects in the boundary layer equation.
This mean zonal shear flow has been studied theoretically and numerically by .

With faster computers and more efficient codes, we compute this flow down to very low viscosity and compare with the inviscid theory of Busse (1968).
In addition we investigate the width and the intensity of the detached shear layer, which is controlled by viscosity and therefore not present in the theory.

We also use this problem as a benchmark to assess the benefits of using a semi-lagrangian numerical scheme, where solid-body rotation is treated exactly.