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Angular momentum of magnetohydrodynamic modes in a rotating triaxial ellipsoid

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Nowadays, the main Earth's magnetic field is accurately monitored from satellites placed on a low orbit. Together with records of the Earth's rate of rotation, the magnetic field observations give precious information about magnetohydrodynamic (MHD) waves in the Earth's fluid core. The propagation of these waves is sensitive to the properties of the core-mantle boundary: height of the interface with respect to a mean sphere; symmetry about the rotation axis; electrical conductivity of the solid mantle adjacent to the fluid core. We develop a 2-D reduced model of the fluid dynamics from a Lagrangian formulation to account for the non-spherical core-mantle boundary. The simplification of such a quasi-geostrophic model rests on the invariance of the fluid velocity parallel to the rotation axis. Additionally, in the ellipsoidal case the velocity components can be expressed as polynomials of the Cartesian coordinates. These approaches enable us to calculate MHD modes both analytically and numerically. We investigate and quantify the angular momentum of these modes, in particular the torsional modes, and check if they can excert a torque on the mantle.