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Turbulent Flows Driven by the Mechanical Forcing of an Ellipsoidal Container[1] BENJAMIN FAVIER, MICHAEL LE BARS, Aix-Marseille Université, CNRS, Ecole Centrale Marseille, IRPHE UMR 7342, ALEXANDER GRANNAN, ADOLFO RIBEIRO, JONATHAN AURNOU, SPINLAB, Earth, Planetary & Space Sciences, UCLA, IRPHE TEAM, SPINLAB TEAM — We present a combination of laboratory experiments and numerical simulations modelling geophysically relevant mechanical forcings. Libration and tides correspond to the periodic perturbation of a body's rotation rate and shape, and are both due to gravitational interactions with orbiting companions. Such mechanical forcings can convey a fraction of the rotational energy available and generate intense turbulence in the fluid interior of satellites and planets. We investigate the fluid motions inside a librating or tidally deformed triaxial ellipsoidal container filled with an incompressible fluid. In both cases, the turbulent flow is driven by the elliptic instability which is a triadic resonance between two inertial modes and the base flow. We characterize the transition to turbulence as triadic resonances develop while also investigating both intermittent and sustained regimes. It is shown that the flow is largely independent of the properties of the mechanical forcing, hinting at a possible universal behaviour of the saturated elliptical instability. The existence of such intense flows may play an important role in understanding the thermal and magnetic evolution of celestial bodies.

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