Abstract Submitted
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Instabilities around a rotating ellipsoid in a stratified fluid[1] BENJAMIN MIQUEL, PATRICE MEUNIER, STEPHANE LE DIZES, Aix Marseille Universite, CNRS, Centrale Marseille, IRPHE UMR 7342, 13384 Marseille, France — Geosismic observations have revealed the stacking of horizontal layers of water with different densities in the ocean, particularly above and beneath lens-shaped eddies. We present a simplified model together with an experimental setup to reproduce and identify the mechanism responsible for this layering phenomenon: we consider the stably stratified flow around a rotating, solid ellipsoid. Experimentally, a flat oblate rotating ellipsoid reproduces faithfully the boundary condition of an oceanic eddy, whereas the case of a rotating sphere provides an analytically tractable base flow, suitable for a numerical linear analysis. Two instabilities are witnessed experimentally and numerically. The first instability is the classical, inviscid, stratoinertial instability that tends to develop at the equator of the ellipsoid independently of the value of the Schmidt number. The second instability is localised in the vicinity of the poles and appears only if the Schmidt number differs from one. Hence, this instability is reminiscent of the double-diffusive McIntyre instability, a valuable candidate to explain layering in oceanic eddies.

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