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A new regime of instability for the stably stratified Taylor-Couette flow PAUL BILLANT, JUNHO PARK, LadHyX, Ecole Polytechnique, CNRS — We show that the stably stratified Taylor-Couette flow is unstable when the angular velocity $\Omega(r)$ increases along the radial direction, a regime never explored before. The instability is different from the centrifugal instability: it is highly non-axisymmetric and involves the resonance of two families of inertia-gravity waves like for the strato-rotational instability. The growth rate is maximum when only the outer cylinder is rotating and goes to zero when $\Omega(r)$ is constant. The sufficient condition for linear, inviscid instability derived previously: $d\Omega^2/dr < 0$ is therefore extended to $d\Omega^2/dr \neq 0$, meaning that only the regime of solid-body rotation is stable in stratified fluids. A WKBJ analysis in the inviscid limit, confirmed by the numerical results, shows that the instability occurs only when the Froude number is below a critical value and only for a particular band of azimuthal wavenumbers. The physical mechanism of the instability will be explained in terms of wave over-reflection.

References: Park J. & Billant P., *J. Fluid Mech.*, **725**, 262-280 (2013); Yavneh, I., McWilliams, J. C. & Molemaker, M. J.,*J. Fluid Mech.* **448**, 1-21 (2001).

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