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Theoretical study of instability observed inside a precessing cylinder WALEED MOUHALI, ECE Paris, THIERRY LEHNER, Luth Observatoire de Paris, AZIZ SALHI, Universit de Tunis, ATER COLLABORATION, ATER COLLABORATION — Cyclones have been observed in our experiment involving water in a both rotating and precessing cylinder. The following mechanism can explain their generation: first the mode coupling of two inertial waves with azimuthal wavenumber m=0 and m=1 (mode forced by the precession) in the inviscid regime (at high Re numbers) creates a differential rotation regime which has been observed in the same experiment at small enough Poincaré number ε (ratio of the precession to the rotation frequencies). Secondly, the radial profile of the corresponding axial mean flow vorticity shows an inflection point leading to a localized inflectional/shear secondary instability. We show that when the parameter ε is increased from low values the mode m=0 becomes the most unstable one in this induced differential rotation at a reproducible threshold in ε, which can induce further the observed cyclones. In addition radial jets coming from the lateral boundary layers have been also observed which can drive additional cyclones by another instability developing in the boundary shear layer in presence of radial flow.

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