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Nonlinear instabilities in a vertical pipe flow discharging from a cylindrical container[1] RAMON FERNANDEZ-FERIA, University of Malaga, ENRIQUE SANMIGUEL-ROJAS, Universidad Politecnica de Cartagena — We report results from three-dimensional numerical simulations of the incompressible flow in a vertical pipe of circular cross-section discharging from a cylindrical container. Natural Coriolis forces due to the Earth rotation triggers the instability of the axisymmetric flow, and nonlinear spiral waves with azimuthal wave number $|n| = 3$ are formed above a critical Reynolds number based on the pipe flow rate (Re_Q). We characterize this critical Reynolds number as a function of the Coriolis parameter (F), that is proportional to the square of the radius of the container. As a difference with previous numerical works on nonlinear instabilities and transition in a pipe flow, here the nonlinear disturbances needed to trigger the instabilities are not artificially introduced inside the pipe flow, but naturally produced by Coriolis forces, the amplitude of these disturbances being characterized by a non-dimensional Coriolis parameter. We find that the pipe flow can be unstable for Re_Q as low as 300 for the largest value of F considered.

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