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Cylindrical gravity currents in a rotating system CHING-SEN WU, ALBERT DAI, National Taiwan University — This study aims at investigating the dynamical processes in the formation of stable cylindrical gravity currents, by a full-depth lock release, in a rotating system conducted by direct numerical simulations. The simulations reproduce the major features observed in the laboratory and provide more detailed flow information. Both the qualitative and quantitative measures are provided through the flow patterns and the predicted energy budgets. At the initial stage, during tenth of a revolution of the system, the Kelvin-Helmholtz vortices form and the flow structure maintain nearly axisymmetric. Afterwards, three-dimensionality of flow quickly develops and the outer rim of current breaks away from the body, which gives rise to the maximum dissipation rate in the system. The detached outer rim continues to propagate outward until a maximum radius of propagation is attained. Then the body of current exhibits a regularly contraction-relaxation motion in a period, the energy is transformed back and forth between potential energy and kinetic energy. With the use of high-resolution of numerical computations, the formation of lobe-and-cleft structure and swirling strength for the rotating gravity currents are clearly observed.

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