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Intermittent cascading interfacial instabilities in gravity currents[1]

JORGE SALINAS, S. BALACHANDAR, University of Florida, MRUGESH SHRINGARPURE, JUAN FEDELE, DAVID HOYAL, ExxonMobil Upstream Research Company, Houston, TX 77389, USA, MARIANO CANTERO, Instituto Balseiro, Universidad Nacional de Cuyo, Consejo Nacional de Investigaciones Cientificas y Tecnicas, Argentina — Submarine gravity currents are flows that are submerged beneath a deep layer of quiescent fluid and that can travel over long distances along the oceanic floor. They are driven by the density difference between the current and the clear ambient fluid above. In this work we present results on highly resolved direct numerical simulations of gravity currents. We perform two simulations of currents in the well-established flow regimes: supercritical and subcritical regimes. We also report on the existence of an intermediate transcritical regime. While the current slowly evolves in the subcritical and supercritical regimes in a near self-similar manner, the transcritical current with its unique cyclical evolution exhibits a limit-cycle like behavior. We investigate how departure from self-sustaining equilibrium state is the mechanism responsible for this cyclic evolution of the transcritical regime.

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