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Nonlinear evolution of an isolated disturbance at two-phase flow interface GENNARO COPPOLA, University of Naples Federico II, FRANCESCO CAPUANO, Centro Italiano Ricerche Aerospaziali (CIRA), LUIGI DE LUCA, University of Naples Federico II — The nonlinear evolution of an isolated, finite-amplitude disturbance at the interface between two immiscible fluids of different density is simulated by means of a discrete vortex method. In contrast to the more standard periodic disturbance, that evolves into the familiar train of Kelvin-Helmholtz (KH) linear waves, the single-wave scenario possess unique features that are not yet well known. The aim of the present contribution is to provide a physical modeling of the nonlinear wave evolution, and to highlight the features that distinguish the nonlinear case from the classical KH model. Numerical simulations are carried out as well. The two-phase interface is represented by a discrete vortex sheet, whose dynamics is simulated by a point vortex method that accounts for density stratification, surface tension and gravity. It is found that the nonlinear wave speed is different from the one predicted by the classical KH theory, as a consequence of the different topology of streamlines. The instability onset threshold, as well as other flowfield properties also change accordingly.

Francesco Capuano
Centro Italiano Ricerche Aerospaziali (CIRA)

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