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Observable regularization of Navier-Stokes equations for incompressible two-phase flows BAHMAN ABOULHASANZADEH, KAMRAN MOHSENI, University of Florida — A common phenomenon exists in turbulence, shock, and two-phase flow problems in which the tail of the energy spectrum goes to infinity. This results in an anomaly that we term k_∞ irregularity. Many different methods are developed over the past few decades to solve each of such problems as separate issues. Recently, we developed the concept of observability and used it to derive the observable two-phase Euler equations, which demonstrated good results and considerable computational saving compared to available computational methods for Euler equations. Here, we first present the usage of observability concept for solving an incompressible two-phase flow with no surface tension, i.e. the Rayleigh-Taylor instability. This problem shows that the method is capable of regularizing the equations with no viscous term; to avoid any numerical dissipation we use a pseudo-spectral method for computing spatial derivatives. The effect of observability on the interface instability and its rate of growth are studied. Then the surface tension term is derived using observable divergence theorem. First, the parasitic currents are studied using a quiescent bubble in zero gravity. Then, a rising bubble is studied and the effect of observability limit is demonstrated.

Bahman Aboulhasanzadeh
University of Florida

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