

Viscous Core-Annular Flows: A Laboratory and Mathematical Playground for Dispersive Hydrodynamics

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Abstract

Dispersive Hydrodynamics is a mathematical framework to describe multiscale nonlinear wave phenomena in dispersive media. It is a vibrant and continuously developing field, with a variety of physical applications. This talk will present experiments with a special core-annular flow—two viscous, miscible fluids with high viscosity contrast, one rising buoyantly within the other—in order to highlight a rich variety of dispersive hydrodynamic phenomena including solitons, dispersive shock waves, breathers, and soliton gases. Along the way, a variety of mathematical techniques will be highlighted in order to describe the experimental findings.