Abstract Submitted
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**Interactions of solitary waves and compression/expansion waves in core-annular flows**[1] MICHELLE MAIDEN, DALTON ANDERSON, Univ of Colorado - Boulder, GENNADY EL, Loughborough University, NEVIL FRANCO, MARK HOEFER, Univ of Colorado - Boulder — The nonlinear hydrodynamics of an initial step leads to the formation of rarefaction waves and dispersive shock waves in dispersive media. Another hallmark of these media is the soliton, a localized traveling wave whose speed is amplitude dependent. Although compression/expansion waves and solitons have been well-studied individually, there has been no mathematical description of their interaction. In this talk, the interaction of solitons and shock/rarefaction waves for interfacial waves in viscous, miscible core-annular flows are modeled mathematically and explored experimentally. If the interior fluid is continuously injected, a deformable conduit forms whose interfacial dynamics are well-described by a scalar, dispersive nonlinear partial differential equation. The main focus is on interactions of solitons with dispersive shock waves and rarefaction waves. Theory predicts that a soliton can either be transmitted through or trapped by the extended hydrodynamic state. The notion of reciprocity is introduced whereby a soliton interacts with a shock wave in a reciprocal or dual fashion as with the rarefaction. Soliton reciprocity, trapping, and transmission are observed experimentally and are found to agree with the modulation theory and numerical simulations.

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