Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Long-Time Asymptotics of a Box-Type Initial Condition in a Viscous Fluid Conduit NEVIL FRANCO, EMILY WEBB[1], MICHELLE MAIDEN, MARK HOEFER, GENNADY EL, None — The initial value problem for a localized hump disturbance is fundamental to dispersive nonlinear waves, beginning with studies of the celebrated, completely integrable Korteweg-de Vries equation. However, understanding responses to similar disturbances in many realistic dispersive wave systems is more complicated because they lack the mathematical property of complete integrability. This project applies Whitham nonlinear wave modulation theory to estimate how a viscous fluid conduit evolves this classic initial value problem. Comparisons between theory, numerical simulations, and experiments are presented. The conduit system consists of a viscous fluid column (glycerol) and a diluted, dyed version of the same fluid introduced to the column through a nozzle at the bottom. Steady injection and the buoyancy of the injected fluid leads to the eventual formation of a stable fluid conduit. Within this structure, a one hump disturbance is introduced and is observed to break up into a quantifiable number of solitons. This structure's experimental evolution is to Whitham theory and numerical simulations of a long-wave interfacial model equation. The method presented is general and can be applied to other dispersive nonlinear wave systems.

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Date submitted: 01 Aug 2017 Electronic form version 1.4