Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Numerical simulations of viscous Faraday waves NICHOLAS O'CONNOR, Dept. of Mechanical Engineering, Virginia Tech, EDGAR KNOBLOCH, Dept. of Physics, Berkeley, PAUL FISCHER, Mathematics and Computer Science Division, Argonne National Laboratory, MARK PAUL, Dept. of Mechanical Engineering, Virginia Tech — We conduct a numerical exploration of the nonlinear dynamics of surface gravity-capillary waves in a fluid layer oscillating vertically in a gravitational field (i.e. the Faraday system). A number of intriguing experimental observations still cannot be explained by available theory, although progress has been made by incorporating the complex interplay between streaming flows generated by oscillating boundary layers and the oscillations that are responsible for them. We perform numerical simulations of the time-dependent incompressible Navier-Stokes equations describing the free surface flow that includes surface tension and the complex moving fluid interface. The numerical approach uses an arbitrary-Lagrangian-Eulerian formulation of a parallel spectral element solver. We explore a two-dimensional fluid layer with periodic and finite lateral boundary conditions, and use the results to quantify the resulting streaming flows which we relate to the overall wave dynamics and available theoretical predictions.

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Date submitted: 02 Aug 2007 Electronic form version 1.4