Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Validation of Nek5000 against low-Atwood, single-mode Rayleigh Taylor experiments[1] MAXWELL HUTCHINSON, Univ of Chicago — Experiments by Wilkinson and Jacobs [1] demonstrate the stagnation and reacceleration phases of the low-Atwood, single-mode Rayleigh Taylor instability between two water mixtures. We reproduce the experimental conditions of three runs in direct numerical simulations using the spectral element code Nek5000. The simulations required 17 billion grid points on 512 thousand cores of the Mira supercomputer to reach Rayleigh numbers up to 90 million. We extend the vertical dimension to reach higher bubble aspect ratios and demonstrate the limits of wall-bounded single-mode studies. Finally, exploration of the full-field results reveals spanwise secondary flows that enhance mixing at low to moderate Reynolds number.

[1] J. P. Wilkinson and J. W. Jacobs, Phys. Fluids 19, 124102 (2007).

[1]This research used resources of the Argonne Leadership Computing Facility, which is a DOE Office of Science User Facility supported under Contract DE-AC02-06CH11357.

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Date submitted: 03 Aug 2015 Electronic form version 1.4