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Study of the Rayleigh-Taylor instability at a hemispherical interface using a magnetorheological fluid JEREMY WHITE, MARK ANDERSON, JASON OAKLEY, RICCARDO BONAZZA, University of Wisconsin — The behavior of a single Rayleigh-Taylor spike is studied starting with a hemispherical interface between water and a magnetorheological (MR) fluid. Experiments are performed with two different MR fluids, one consisting of carbonyl iron particles suspended in mineral oil with a small amount of surfactant, the other of carbonyl iron particles suspended in water with a small amount of a suspension agent. This allows for the study of two different pairs of Atwood and Reynolds numbers. A sharp, membrane-less interface is created by freezing water in a mold containing the desired perturbation, and then freezing the MR fluid on top of the ice using a magnetic field. Once the ice melts, the magnetic field is released, and the development of the Rayleigh-Taylor instability is observed using back-lighting and a high speed digital camera framing at 262 frames per second. The growth rates are compared with linear and non-linear theories, and the scaled spike velocities are compared with the results of recent potential flow theories as well as numerical results.

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