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Particle-tracking velocimetry analysis of liquid drainage within individual Plateau borders in aqueous foam MATTHEW J. KENNEDY[1], MICHAEL W. CONROY, RAMAGOPAL ANANTH, JAMES W. FLEMING, Naval Research Laboratory — Foam drainage theory describes macro-scale liquid drainage for a body of foam based on the microscopic flow within individual Plateau borders and within the nodes which occur at the intersections of multiple Plateau borders. The present study measures micro-scale liquid velocities within individual Plateau borders using microparticle image velocimetry, and it measures macro-scale liquid drainage using a weighing scale. Measurements take place over the course of free drainage for foam which is initially wet with initial liquid fraction equal to 20% averaged over the height of the foam. Preliminary results show that the flow dynamics within individual Plateau borders evolve according to similar trends as the macro-scale volume of liquid drained. Foam drainage theory agrees with both measurements after an initial transition period, but during initial drainage the experimentally measured drainage rate exceeds that predicted by the theory. We discuss implications of the agreement between the micro-scale and macro-scale measurements as well as potential sources for the unexpectedly high drainage rate which occurs at the beginning of drainage.

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