Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Surface Bubble Coalescence[1] DANIEL SHAW, LUC DEIKE, Princeton University — Bubble coalescence at a free surface occurs in our daily lives with drinks and on a global scale at the surface of the ocean. We present an experimental study of bubble coalescence at an air-water interface, and characterize the evolution of both the underwater neck and the surface bridge. We explore a wide range of Bond number, which compares gravity and capillary forces and is a dimensionless measure of the free surface's effect on bubble geometry. The nearly spherical $Bo \ll 1$ bubbles exhibit the same inertial-capillary growth of the classic underwater dynamics, with limited upper surface displacement. For $Bo > 1$, the bubbles are non-spherical - residing predominantly above the free surface - and while an inertial-capillary scaling for the underwater neck growth is still observed, the controlling length scale is defined by the curvature of the bubbles near their contact region. With it, an inertial-capillary scaling collapses the neck contours across all Bond number to a universal shape. Finally, we characterize the upper surface with a simple oscillatory model which balances capillary forces and the inertia of liquid trapped at the center of the liquid-film surface.

[1]This material is based upon work supported by the National Science Foundation Graduate Research Fellowship Program under Grant No. 1656466 to D.B.S. In addition, this work was supported by the National Science Foundation (Physical Oceanography) under Grant No. 1849762 to L.D.; the Princeton Catalysis Initiative and the Princeton Environmental Institute.

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Date submitted: 31 Jul 2020 Electronic form version 1.4