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Squeezing and de-wetting of a drop between plane-parallel walls: a model problem for understanding capillary adhesion THOMAS WARD, UCLA — The radial squeezing and de-wetting of a thin film of viscous Newtonian fluid filling the gap between parallel plane walls is examined both experimentally and theoretically for gap spacings much smaller than the capillary length ($< 1\ mm$). The interaction between squeezing or de-wetting and surface tension is parameterized by a single dimensionless variable, F, which is the ratio of the constant force supplied by the top plate to surface tension acting on the spreading drops circumference. In the de-wetting problem the analytical solution reveals the formation of a singularity, leading to capillary adhesion, as the gap spacing approaches a critical value that depends on F and the contact angle. Experiments are performed to test the analytical predictions for both squeezing and de-wetting by using 3 fluids with different viscosity and surface tension for gap spacings O(10-1000 μm). There is excellent agreement between theory for the change in gap spacing and the experimental results for either squeezing or de-wetting.

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