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Friction Measurements With Dewetted Polymer Droplets: Bridging the Gap in Contact Area Between Lateral Force Microscopy and the Surface Forces Apparatus ANDREW B. CROLL, KARI DALNOKI-VERESS, Physics and Astronomy, McMaster University — Lateral Force Microscopy (LFM) is an important tool that essentially created the field of nano-tribology some 20 years ago. The interest in this technique stems from its ability to measure true single asperity surface contact. Although tremendously successful, LFM lacks the ability to vary contact area without complicated tip modifications, most of which require modeling to determine contact area. At the other end of the contact area length scale is the Surface Forces Apparatus (SFA). This technique allows for extremely high precision friction measurements, but only on macroscopic lateral length scales. Here we present a simple technique that uses dewetted polystyrene droplets (spherical caps) to overcome these obstacles. Droplets are reversibly attached to conventional atomic force microscope tips, and scanning takes place much as in LFM. The dewetted droplets have the advantage of very flat, well-defined, rigid contact with the substrate, over several orders of magnitude in area ($\sim$10 μm^2 – 10000 μm^2). Measurements on an extremely thin poly(dimethyl siloxane) layer yield insight into the complex interplay between viscosity and elasticity in thin polymer lubricants.

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