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Sub-Micron Velocity Measurements near a Moving Contact Line
JEREMIAH ZIMMERMAN, MARK M. WEISLOGEL, DEREK C. TRETHEWAY, Portland State University — The displacement of one fluid by an immiscible second fluid (i.e. dynamic wetting), governs many natural and technological processes. Despite extensive studies, understanding and modeling the displacement process remains one of the outstanding problems in fluid mechanics. In this work, we explore the physics of the moving contact line (the idealized line of intersection between two fluids and a solid) with micron resolution particle image velocimetry (μPIV), which enables sub-micron two-dimensional velocity measurements. The measured flow is generated by dynamic wetting in a glass microchannel. The microchannel is mounted on an automated microscope stage with precise velocity control allowing for the static placement of the contact line within the field of view. Full-field velocity measurements within 1 μm of the contact line were made in water/glycerol and fructose/glucose/water solutions. Preliminary results appear to show remarkable similarity to controversial theoretical predictions.

Jeremiah Zimmerman
Portland State University

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