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Micron-scale measurements of the flow field near a moving contact line BIAN QIAN, KENNETH BREUER, Brown University — It has long been known that a continuum hydrodynamic description using a no-slip boundary condition breaks down near a moving contact line. Theoretical models including microscopic effects, such as velocity slip and a diffuse interface, have been proposed to relieve the contact line singularity. Although experimental testing of the theoretical models has been attempted by measuring the apparent dynamic contact angle, few efforts have been made to map the flow field close to a moving contact line. We experimentally investigated the flow motion near the moving contact line of a liquid bridge, which is trapped between a stationary hanging rod and a glass substrate which can be moved at a controlled speed. The flow field was seeded with nanoscale fluorescent particles visualized using both flood illumination and evanescent wave (TIRF). The motion was captured using a high speed camera equipped with a high-magnification microscopic objective. These experimental arrangements enable to resolve the flow field within 10 microns of the contact line and as close as 100nm above the moving substrate. The characteristics of the flow, including slip lengths as a function of distance from the contact line can be calculated from the flow field.

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