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Effects of length scale on determining surface dilatational viscosity JONATHAN LEUNG, AMIR HIRSA, Rensselaer Polytechnic Institute, JUAN LOPEZ, Arizona State University — Numerous scientific, industrial, and consumer applications continue to emerge for surface-active monomolecular films (surfactant monolayers), yet no reliable predictive model exists for these monolayer systems. Most commonly, flow of a monolayer-covered interface is assumed to be Newtonian and is treated with the Boussinesq-Scriven surface model coupled to the Navier-Stokes equations for the bulk. The model usually breaks down when applied to flows where surface dilatational viscosity is significant. This may be attributed to the presence of coexisting phase domains in the monolayer, which are not explicitly considered in the surface model. In the present study, the flow of a monolayer-covered interface in a periodically driven elongated cavity is measured using two methods. "Microscopic" velocity measurements are obtained by tracking individual coexisting phase domains using Brewster angle microscope (BAM) images. "Macroscopic" velocity measurements are obtained by performing DPIV cross-correlation on the BAM images which include numerous domains. Although both of these methods provide microscopically precise measurements of the velocity, only the DPIV on BAM method provides statistically relevant data. The "macroscopic" results from DPIV on BAM provide results consistent with the predictions from the Boussinesq-Scriven model.

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