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Experimental microrheology of quiescent soap films[1] VIKRAM PRASAD, ERIC R. WEEKS, Department of Physics, Emory University, Atlanta GA 30322 — A soap film consists of a thin water layer that is separated from two bulk air phases above and below it by surfactant monolayers. Previous experiments (Prasad, Koehler and Weeks, PRL 2006) have shown that the coupling between an interface and an infinite bulk fluid is set by a length scale, the ratio between the interfacial viscosity and the bulk viscosity (of order microns to millimeters). This length scale determines the nature of the flow field in the interface and the adjoining bulk phases. In the case of soap films, the thickness of the water layer is an additional length scale, and therefore the exact nature of the coupling between the thin water layer, the surfactant interface and the bulk air phases is unclear. In order to determine this coupling, we use polystyrene spheres as tracer particles and track their motion in the soap films, using both one-and two-particle microrheology. The experimental results are compared to theory, and the consequences for the hydrodynamics of interfaces are discussed.

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