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Cylinder wakes in quasi-two-dimensional flows with surface friction II: effects of film thickness[1] JAMIE H.W. LI, JEMIN SHIM, PAUL W. FONTANA, Seattle University — Vortex shedding in a quasi-two-dimensional system with homogeneous drag (Ekman friction) is observed to have different phenomenology than in systems without friction. To understand why, we studied the wakes of circular cylinders in a vertical soap film channel and measured thickness profiles (pachymetry) of the film in the cylinder wake. The kinematic viscosity and drag coefficients in this system both depend on the thickness of the soap film, which varies over the wake. To measure thickness, broad-spectrum light is reflected off the film, and the resulting interference pattern of intensity vs. wave number is measured. The spacing in wave number of the interference minima is proportional to the film thickness, giving high-accuracy thickness measurements with a precision on the order of 0.2%. Pachymetry profiles transverse to the mean flow were measured at five longitudinal positions for various values of Reynolds number and drag parameter. Possible causes for differences in the dynamics from conventional systems could be: ambiguity in the specifications of Reynolds number or non-Newtonian effects arising from viscosity gradients, elastic effects particular to soap films, or surface friction. The pachymetry results favor the latter explanation.

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