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Inertial contributions to friction measurements in thrust bearings JONATHON SCHUH, University of Illinois at Urbana-Champaign — Surface textures decrease friction in lubricated sliding contact. Traditionally, the friction reduction for a given textured surface is determined by using the Reynolds equation, which neglects fluid inertia. However, as the separation and relative motion between the surfaces increase, inertia can affect the measured tangential and normal forces for flow over a textured surface, and thus cause the coefficient of friction to differ from the purely viscous, Stokes flow prediction. Here, the increase in torque and normal force between a moving plate and stationary textured surface, which simulates a textured thrust bearing, are calculated as a function of the Reynolds number in the thin film limit. The predictions for a non-textured thrust bearing are compared to fully 3-D numerical simulations of the incompressible Navier-Stokes equation, and the predictions for textured thrust bearings are compared to experimental data given in the literature. Good agreement is seen between the predictions and the data, validating the predicted scaling laws. This work also suggests that inertia can be used as a secondary effect to reduce friction in lubricated sliding, and textures that take advantage of the inertial effects will have lower friction than those that only use purely viscous effects.

Jonathon Schuh
University of Illinois at Urbana-Champaign

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