Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Drag on a liquid-infused superhydrophobic cylinder[1] JESSICA SHANG, Princeton University, ALEXANDER SMITS, Princeton University; Monash University, HOWARD STONE, Princeton University — We examine the effect of liquid-infused superhydrophobic surfaces on the separation over a circular cylinder for Reynolds numbers $400 < Re_D < 1700$. Two superhydrophobic surfaces are compared with a smooth untreated surface. A thin lubricant film (1-20 microns in thickness) is applied to a surface with isotropic nanoscale texture and also to a surface with 50 μm-deep, 65 μm-wide triangular grooves aligned with the flow. The viscosity and thickness of the lubricant are varied. With a superhydrophobic surface, the drag increases by 0 to 5%; greater drag is experienced by the microstructured surface. Drag does not appear to depend on the thickness of the overlying lubricant. In contrast to superhydrophobic surfaces with gas-filled cavities, liquid-infused surfaces produce no change in the Strouhal number. The source of the drag increase is rationalized using the structure of the measured velocity fields near the cylinder.

[1]Supported by ONR N00014-12-1-0875

Jessica Shang
Princeton University

Date submitted: 01 Aug 2014 Electronic form version 1.4