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Lubricant retention for liquid infused surfaces exposed to turbulent flow[1] MATTHEW FU, MARCUS HULTMARK, Princeton University — Liquid infused surfaces have been proposed as a robust alternative to traditional, air-filled superhydrophobic surfaces. The mobility of the liquid lubricant facilitates a surface slip with the outer turbulent shear flow. However, shear driven drainage in turbulent flow has been found to be a primary failure mechanism for such surfaces, resulting in loss of lubricant and the associated slip effect. A turbulent channel flow facility is used to characterize shear-driven drainage behavior of liquid infused micro-patterned surfaces. Micro-manufactured surfaces can be mounted flush in the channel and exposed to turbulent flows. The retention of fluorescent lubricants is monitored to characterize how surface geometry and lubricant properties affect the steady state retention length. Results are compared with theoretical predictions and experiments for lubricant retention in laminar microchannels, where the shear driven drainage is balanced by a Laplace pressure gradient, to determine the additional drainage induced by turbulent fluctuations.

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Matthew Fu
Princeton Univ

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