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Modification of no-slip boundary condition by superhydrophobic wall patterning RICHARD TRUESDELL, ANDREA MAMMOLI, PETER VOROBIEFF, The University of New Mexico, FRANK VAN SWOL, Sandia National Laboratories — There has been a recent wave of interest in challenging the idea of a "no-slip" boundary condition for fluids at a solid surface. We study fluid flow in the vicinity of textured and superhydrophobically coated surfaces. Grooved PDMS (polydimethylsiloxane) surfaces with groove spacing 25μm are coated with a thin aerogel film creating a superhydrophobic surface. These surfaces are attached to the inner cylinder of a Couette flow apparatus. The apparent viscosity of the fluid situated between the inner and outer rotating cylinder is measured with a viscometer at different strain rates. Apparent reduction in the viscosity would indicate change in the macroscopic boundary condition. We present evidence that, while the actual slip length remains very small, the grooves reduce the fluid-surface contact area, leading to appreciable drag reduction that can be interpreted as "effective slip." The flow physics are further elucidated by micro-PIV imaging of the flow in the immediate vicinity of the textured surface.

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