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Pressure Driven Turbulent Flow in a Channel with Superhyrophobic Riblets ARIAN YOUSEFI, ILENIA BATTIATO, Clemson University — In the past decades, many studies have focused on the ability of micro-patterned surfaces to reduce the fluid resistance in micro-fluidic applications. They revealed that micro-structures treated with hydrophobic coatings can significantly reduce skin drag in both laminar and turbulent regimes. We study pressure driven Navier-Stokes flow through and over a periodic rectangular array of alternating ribs and grooves parallel to the flow direction. The fluids inside and above the grooved surface are air and water, respectively. We employ the method of eigenfunction expansion combined with a domain decomposition approach to obtain a semi-analytical solution for the flow velocity within and above the grooves. The local and mean velocity profiles inside the grooves, the slip length and the slip velocity are determined for a number of different scenarios. Finally, we compare our semi-analytical solution with experimental data.

Arian Yousefi
Clemson University

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