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Turbulent drag reduction over liquid infused surfaces[1] ISNARDO ARENAS, The University of Texas at Dallas, MATTEO BERNARDINI, Universita' di Roma La Sapienza, STEFANO LEONARDI, The University of Texas at Dallas — Numerical Simulations of two superposed fluids in a turbulent channel with a textured surface made of either longitudinal square bars or staggered cubes have been performed. The viscosity of the fluid inside the substrate is ten times smaller than that of the main stream ($m = \mu_1/\mu_2 = 0.1$ where the subscripts 1 and 2 indicate the fluid in the cavities and the overlying fluid respectively). The interface between the two fluids can move due to the turbulent pressure fluctuations and it is modeled with a Level Set Approach. Two cases are compared: $We = 0$, implying an interface sustained by the surface tension which can slip only in the horizontal direction, and $We = \infty$ where the interface can be displaced vertically and deform subject to wall normal stress. The textured surface made of staggered cubes is the most sensitive to the value of the surface tension, providing a drag reduction ranging between $15 - 30\%$ for $We = 0$ and approximately 40% drag increase when $We = \infty$. On the other hand, longitudinal square bars, even with $We = \infty$ present a drag smaller than that over a smooth wall.

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