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Direct Numerical Simulation of two superposed viscous fluids in a channel with cavities on the wall STEFANO LEONARDI, University of Puerto Rico at Mayaguez, PAOLO ORLANDI, Universita' degli Studi di Roma "La Sapienza" — Parallel shear flow of two viscous fluids has received much attention in the past. An instability associated with the jump in viscosity at the interface between two fluids has been observed and it depends on the wavenumber of the flow disturbance, on the depth ratio and the viscosity ratio of the fluids. In the present paper, we extend previous findings by performing Direct Numerical Simulations of two superposed viscous fluids over rectangular cavities in a channel. The interface between the two fluids is slightly above the crests plane of the cavities. This configuration represents a simplified and preliminary model of a Slippery Liquid-Infused Porous Surface (SLIPS) promising for drag reduction. Periodic boundary conditions apply in the streamwise and spanwise direction. A parametric study has been carried out varying the viscous ratio, the Reynolds number of the inner flow, the aspect ratio of the cavities and the depth of the near wall fluid. A finite difference code, based on a Runge Kutta and fractional step, has been used. Roughness on the walls has been modeled using the immersed boundary method. Frictional and form drag and transition to turbulence depend strongly on the cavity shape and on the viscous ratio.

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