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Near-wall turbulence structure in Poiseuille-Couette flow[1] DIMITRIOS PAPAVASSILIOU, NICHOLAS SPENCER, The University of Oklahoma, COMPUTATIONAL TRANSPORT PROCESSES TEAM — Given recent reports that ultra-hydrophobic surfaces generate slip at the wall in laminar flows, the question arises whether turbulence drag reduction can be achieved over such surfaces. If so, how is the near-wall turbulence structure affected? This work focuses on the effects that a specified wall velocity (or wall slip) can have on the turbulence field. Direct numerical simulations of a Poiseuille-Couette flow channel were used. Computations were completed for Re=5200 (based on centerline mean velocity and channel width). The runs included the cases where one wall moved with 0, 1, 2 and 4 plus velocity units in the flow direction relative to the opposite channel wall. The mean velocity maximum shifted towards the moving wall as the wall velocity increased, as well as the point at which the Reynolds stress crossed zero. The turbulence intensity was lower close to the moving wall side. The velocity correlation coefficients showed that near-wall structures became shorter. The paper will discuss the implications on slip-induced drag reduction.

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