Abstract Submitted
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Turbulent channel flows over complex walls MARCO EDOARDO ROSTI, LUCA BRANDT, KTH Mechanics — We perform numerical simulations of turbulent channel flows over porous walls and deformable hyper-elastic walls. The flow over porous walls is simulated using volume-averaged NavierStokes equations within the porous layers, while the multiphase flow over deformable walls is solved with a one-continuum formulation which allows the use of a fully Eulerian formulation. New insights on the effect of these complex walls on the turbulent flows in terms of friction, statistics and flow structures are discussed using a number of post-processing techniques. The turbulent flow in the channel is affected by the porous and moving walls in a similar manner even at low values of porosity and elasticity due to the non-zero fluctuations of vertical velocity at the interface that influence the flow dynamics. The near-wall streaks and the associated quasi-streamwise vortices are strongly reduced near porous and deformable isotropic wall while the flow becomes more correlated in the spanwise direction. On the contrary, an opposite behavior is noticed in the case of anisotropic porous layers, with an increase of streamwise correlation due to a strengthening of the low- and high-speed streaks.

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