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Equilibria and Travelling wave solutions for Couette and channel flows with longitudinal grooves SABARISH VADAREVU, ATI SHARMA, BHARATHRAM GANAPATHISUBRAMANI, University of Southampton — Several classes of exact solutions for canonical flows have been computed by earlier researchers. These solutions are known to inform the flow of turbulence in state-space. We extend two classes of exact solutions, equilibria and travelling wave solutions, from flat-walled Couette and channel flows to grooved geometries with groove-amplitudes as high as 20% of channel half-height. These solutions provide insight into the mechanics of how a wavy wall could influence turbulent flow. Plotting scalars such as the average shear stress at the wall and the bulk velocity (for channel flows) allows us to identify branches of solutions that could have greater contributions to turbulence, and reconcile the curious phenomenon of drag reduction observed in some riblet-mounted boundary layer flows. Earlier researchers have proposed using modified boundary conditions (imposed on flat surfaces) as a substitute to imposing the traditional no-slip and impermeability conditions on a rough wall. We compare solutions for grooved flows to those for flat-walled flows with modified boundary conditions to evaluate the validity of such simplification to non-laminar solutions.

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