Abstract Submitted
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Turbulent pipe flow drag reduction by discrete counter-rotating strips. MARKUS SCHWAENEN, Virginia Polytechnic Institute and State University, TRAVIS THURBER, Columbia University, ANDREW DUGGLEBY, Texas A&M University, KENNETH S. BALL, Virginia Polytechnic Institute and State University — Spanwise wall oscillations have been shown to result in as much as 45% drag reduction in turbulent channel flows, as widely reported in the literature. A recent study [Duggleby et al., Phys. Fluids **19**, 125107 (2007)] has shown that in turbulent pipe flow with $Re_\tau = 150$, a 27% increase in mean velocity, corresponding to reduced drag, results when the entire pipe wall is oscillated about the axis of the pipe. In the current study, we show that significant drag reduction still occurs when a series of discrete circumferential strips, placed at finite intervals along the axis of the pipe, are rotating in alternating directions. Results for this new method of drag reduction are presented for a turbulent pipe flow with $Re_\tau = 150$. Computations were performed with two separate codes: a finite volume Large Eddy Simulation (LES) code and a spectral element Direct Numerical Solution (DNS) code. Both methods show a flow rate increase of about 10% when the flow is driven by a constant pressure gradient. The effect of strip width and spacing between strips is examined.

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