Abstract Submitted
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Spectral analysis of Reynolds shear stress in high Re turbulent channel flows[1] ROBERT MOSER, University of Texas at Austin, MYOUNGKYU LEE, Sandia National Laboratory — We perform spectral analysis of the terms in the transport equation Reynolds shear stress, $\langle u'v' \rangle$ in high *Re* wall-bounded turbulent channel flows, using the analysis technique from Lee & Moser (J. Fluid Mech., vol 860, 886-938). Specifically, a log-polar representation of two-dimensional spectra are used to study the interactions of turbulence at different length-scales and wall-normal distances. The analysis results show that $\langle u'v' \rangle$ production occurs primarily in the streamwise-elongated modes. Inter-scale transfer at fixed wall-normal distances transfers shear-stress to modes that are elongated in the spanwise direction, especially away from the wall. Wall-normal transport then moves this streamwise-elongated stress to the other side of the channel. This exchange of stress between the two sides of the channel is the primary balance of the production, since the dissipation is relatively weak. Wall-normal transport of streamwise-elongated modes is more complex, with $\langle u'v' \rangle$ exchange driven by the increasing spanwise scale of the dominant stress carrying modes. Finally, away from the wall, the characteristic length scales of production and wall-normal transport mechanisms grow linearly with wall-normal distance.

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