Abstract Submitted
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Statistics of the Energy Dissipation Rate and Local Enstrophy in Turbulent Channel Flow[1] JOERG SCHUMACHER, TU Ilmenau, Germany, PETER E. HAMLINGTON, Naval Research Laboratory, USA, DMITRY KRASNOV, THOMAS BOECK, TU Ilmenau, Germany — Using high-resolution direct numerical simulations, the height and Reynolds number dependence of the higher-order statistics of the energy dissipation rate and local enstrophy are examined in incompressible, fully-developed turbulent channel flow. The statistics are studied at a range of wall distances, spanning the viscous sublayer to the channel flow centerline, for friction Reynolds numbers $Re_\tau = 180$ and $Re_\tau = 381$. The high resolution of the simulations allows dissipation and enstrophy moments up to fourth order to be calculated. These moments show a dependence on the distance from the wall, and Reynolds number effects are observed at the edge of the logarithmic layer for the enstrophy. Conditional analysis based on locations of intense vorticity is also carried out in order to determine the contribution of vortical structures to the moments of the dissipation and enstrophy. Our analysis shows that, for the simulation at the larger Reynolds number, the small-scale fluctuations of both dissipation and enstr ophy become independent of distance from the wall for $z^+ > 100$.

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