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Effects of Computation Pipe Length on Turbulence Statistics using DNS of Turbulent Pipe Flow CHENG CHIN, ANDREW OOI, IVAN MARUSIC, The University of Melbourne, HUGH BLACKBURN, Monash University — Direct numerical simulation (DNS) of fully developed turbulent pipe flow is carried out at $Re_\tau \approx 170$ and 500 (based on friction velocity, u_τ, and pipe radii, δ) to investigate the effects of computational pipe length on the turbulence statistics. Here the DNS uses a spectral scheme in the streamwise and azimuthal directions. Various turbulence statistics are compared for different pipe lengths including the mean flow, Reynolds stresses, correlations, one-dimensional energy spectra, and skewness and flatness.The results show that in the near wall region (below the buffer region, $z^+ \leq 30$ say), a required pipe length of at least O(3000) viscous wall units is required for all turbulent statistics to converge and be independent of the length. In the outer region, comparison of spectra suggest that pipe length of $6\pi\delta$ is sufficient for the results to be pipe-length independent. Preliminary results for higher order statistics suggest that longer lengths may be required.

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