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**Generation of Turbulent Inflow Conditions for Pipe Flow via an Annular Ribbed Turbulator** NIMA MOALLEMI, JOSHUA BRINKERHOFF, Univ of British Columbia — The generation of turbulent inflow conditions adds significant computational expense to direct numerical simulations (DNS) of turbulent pipe flows. Typical approaches involve introducing boxes of isotropic turbulence to the velocity field at the inlet of the pipe. In the present study, an alternative method is proposed that incurs a lower computational cost and allows the anisotropy observed in pipe turbulence to be physically captured. The method is based on a periodic DNS of a ribbed turbulator upstream of the inlet boundary of the pipe. The Reynolds number based on the bulk velocity and pipe diameter is 5300 and the blockage ratio (BR) is 0.06 based on the rib height and pipe diameter. The pitch ratio is defined as the ratio of rib streamwise spacing to rib height and is varied between 1.7 and 5.0. The generation of turbulent flow structures downstream of the ribbed turbulator are identified and discussed. Suitability of this method for accurate representation of turbulent inflow conditions is assessed through comparison of the turbulent mean properties, fluctuations, Reynolds stress profiles, and spectra with published pipe flow DNS studies. The DNS results achieve excellent agreement with the numerical and experimental data available in the literature.

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