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Higher-order moments and their modeling approximations in turbulent channel flow ELBERT JEYAPAUL, National Institute of Aerospace, GARY COLEMAN, NASA Langley Research Center — Third- and fourth-order moments and the terms in their budgets are evaluated using results from Direct Numerical Simulations (DNS) of turbulent channel flow at $Re_\tau = 395$, to aid in the development of higher-order Reynolds-Averaged Navier Stokes (RANS) closure models. These models have been proposed as a means of obtaining more accurate predictions of complex flows. The DNS data is used to test the assumptions that have been made to model the turbulent diffusion, velocity-pressure gradient and dissipation terms in the higher-order transport equations. The validity of using the Gram-Charlier Probability Density Function (PDF) to extrapolate the fourth-order moments from the lower-order ones is examined, as is the Millionshchikov hypothesis of quasi-normal distributions of the fourth-order moments. The wall-correction-free velocity-pressure gradient model of Poroseva (2001) is assessed, along with the assumption for wall-bounded flows of zero-dissipation in the third- and fourth-order equations.

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