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The Contribution of Statistical Errors in DNS Data Quantified with RANS-DNS Simulations[1] SVETLANA V. POROSEVA, University of New Mexico, ELBERT JEYAPAUL, None, SCOTT M. MURMAN, NASA Ames Research Center, JUAN D. COLMENARES F., University of New Mexico — In RANS-DNS simulations, the Reynolds-averaged Navier-Stokes (RANS) equations are solved, with all terms but molecular diffusion being represented by the data from direct numerical simulations (DNS). No turbulence modeling is involved in such simulations. Recently, we demonstrated the use of RANS-DNS simulations as a framework for uncertainty quantification in statistical data collected from DNS. In the current study, contribution of the statistical error in the DNS data uncertainty is investigated using RANS-DNS simulations. Simulations of the Reynolds stress transport were conducted in a planar fully-developed turbulent channel flow at Re = 392 (based on the friction velocity) using DNS data collected at seven averaging times. The open-source CFD software OpenFOAM was used in RANS simulations. Budgets for the Reynolds stresses were obtained from DNS performed using a pseudo-spectral (Fourier/Chebyshev-tau) method.

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