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Scale sensitivity of velocity and pressure correlations in channel flow OLOF GRUNDESTAM, SHARATH S. GIRIMAJI, Texas A&M University — The scale sensitivity of the GCM – generalized central moments (Germano, M. 1992 Turbulence: the filtering approach. J. Fluid Mech. 238 325-336) - of velocity, pressure-strain and dissipation correlations is investigated in channel flow. Pressure and velocity correlations are computed from direct numerical simulation data sets of nonrotating plane channel flow at Reynolds numbers 180 and 250 based on the wall-shear velocity and channel half-width (δ). The GCMs are evaluated using a tophat filter in the physical periodic stream- and spanwise directions. It is found that, depending on wall-normal position, 70 - 90% of energy of the velocity fluctuations is carried by scales smaller than δ . This fraction is higher closer to the wall than in the center of the channel. The pressure strain and dissipation correlations are also to a major part carried by scales smaller than δ . The rapid pressure strain part is, however, more sensitive to large filter widths than its slow counterpart and the dissipation. The implications for multi-resolution turbulence modeling (e.g. DES, hybrid RANS=LES) will be discussed.

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