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**Reynolds Stress Closure for Inertial Frames and Rotating Frames**

CHARLES PETTY, ANDRE BENARD, Michigan State University — In a rotating frame-of-reference, the Coriolis acceleration and the mean vorticity field have a profound impact on the redistribution of kinetic energy among the three components of the fluctuating velocity. Consequently, the normalized Reynolds (NR) stress is not objective. Furthermore, because the Reynolds stress is defined as an ensemble average of a product of fluctuating velocity vector fields, its eigenvalues must be non-negative for all turbulent flows. These fundamental properties (realizability and non-objectivity) of the NR-stress cannot be compromised in computational fluid dynamic (CFD) simulations of turbulent flows in either inertial frames or in rotating frames. The recently developed universal realizable anisotropic prestress (URAPS) closure for the NR-stress depends explicitly on the local mean velocity gradient and the Coriolis operator [1]. The URAPS-closure is a significant paradigm shift from turbulent closure models that assume that dyadic-valued operators associated with turbulent fluctuations are objective. [1] Koppula, K.S., A. Benard, and C. A. Petty, 2011, Turbulent Energy Redistribution in Spanwise Rotating Channel Flows, *Ind. Eng. Chem. Res.*, 50 (15), 8905-8916.

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