DNS evaluation of Reynolds stress models and Generalized Langevin models using velocity-acceleration correlation[1] XINYU ZHAO, ALEXANDROS MATHIOUDAKIS, University of Connecticut — Velocity-acceleration correlation is used to evaluate the pressure-rate-of-strain term for Reynolds-stress based models and the drift coefficient in the generalized Langevin model. The direct numerical simulations (DNS) of a non-premixed temporally-evolving slot jet flame and a premixed temporally-evolving slot jet flame are used. Both flames feature moderate Reynolds numbers, as well as highly anisotropic and inhomogeneous flow environment. Good agreement is achieved between turbulent statistics obtained from velocity-acceleration correlation and those obtained directly from DNS. Different filter sizes are then applied to the DNS database to further test the feasibility of representing pressure-rate-of-strain term and the drift coefficient using velocity-acceleration correlation in experiments or large eddy simulations. Behaviors of turbulent statistics obtained from the premixed flame and those from the nonpremixed flame are analyzed. Finally, the applicability of existing generalized Langevin model coefficients to flame simulations is discussed.

Xinyu Zhao
University of Connecticut

Date submitted: 31 Jul 2015   Electronic form version 1.4