Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Evaluation of subgrid dispersion models for LES of spray flames
QING WANG, Stanford University, XINYU ZHAO, University of Connecticut, LUCAS ESCLAPEZ, PAVAN GOVINDARAJU, MATTHIAS IHME, Stanford University — Turbulent dispersion models for particle-laden turbulent flows have been studied extensively over the past few decades, and different modeling approaches have been proposed and tested. However, the significance of the subgrid dispersion model and its influence on the flame dynamics for spray combustion have not been examined. To evaluate the performance of dispersion models for spray combustion, direct numerical simulations (DNS) of three-dimensional counterflow spray flames are studied. The DNS configuration features a series of different droplet sizes to study effects of different Stokes numbers. An *a priori* comparison of the statistics generated from three subgrid dispersion models is made, for both non-reacting and reacting conditions. Improved agreement with DNS is shown for the stochastic model and the regularized deconvolution model than a closure-free model. The effect of filter sizes in relation to droplet sizes are investigated for all models. Subsequently, *a posteriori* modeling of the same configuration with different resolutions is performed to compare these models in the presence of other subgrid models. Finally, models for the subgrid closure of scalar transport for multiphase droplet combustion are proposed and evaluated.

Xinyu Zhao
University of Connecticut

Date submitted: 01 Aug 2016 Electronic form version 1.4