Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

A Novel Experiment-Based Framework for Turbulent Combustion Modeling RISHIKESH RANADE, TAREK ECHEKKI, North Carolina State University — A novel framework for turbulent combustion modeling is presented. The framework is based on the construction of conditional means and joint scalar PDFs from multiscalar measurements in flames based on the parameterization of composition space using principal component analysis (PCA). The resulting principal components (PCs) act as both conditioning and transported variables. Their chemical source terms are constructed starting from instantaneous temperature and species measurements using a variant of the pairwise mixing stirred reactor (PMSR) approach. A multi-dimensional kernel density estimation (KDE) approach is used to construct the joint PDFs in PC space. The PDFs' dimension corresponds to the number of retained PCs that represent the composition space. Convolutions of these joint PDFs with conditional means provide measures of the unconditional means for the closure terms: the mean PCs chemical source terms and the density. The framework is demonstrated a priori and a posteriori using data from different flames.

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Date submitted: 01 Aug 2019 Electronic form version 1.4