Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Data-Based Optimum Strategies for Combustion Large-Eddy Simulation HESSAM MIRGOLBABAEI, TAREK ECHEKKI, North Carolina State University — In turbulent combustion, moment-based methods have enjoyed widespread use for solving turbulent combustion flows. In these methods, the combustion process is predicted using transport equations for moments (e.g. the mixture fraction) with additional closure needed to determine other thermochemical scalars. The choice of moments is driven by both intuition and experience; but, there is a growing need for optimum strategies to determine these moments. In this work, re-parameterization of the thermochemical state space of combustion flows is performed based on one- dimensional turbulence (ODT) simulations. The re-parameterization identifies optimum transported moments and tabulate key terms in their transport equations. The approach is implemented using principal component analysis (PCA) as a first step towards the evaluation of an optimum set of moments (the principal components) that can represent the thermochemical scalars in the data. Parameters from the PCA analysis can be used to evaluate key terms in the transport equation for these moments. These terms are tabulated using artificial neural network (ANN).

Hessam Mirgolbabaei
North Carolina State University

Date submitted: 05 Aug 2011 Electronic form version 1.4