Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

***A priori* DNS evaluation of the shadow-position mixing model in turbulent reactive flows** XINYU ZHAO, Combustion Energy Frontier Research Center, Princeton University, ANKIT BHAGATWALA, JACQUELINE CHEN, Combustion Research Facility, Sandia National Laboratories, DANIEL HAWORTH, Department of Mechanical and Nuclear Engineering, Pennsylvania State University, STEPHEN POPE, Sibley School of Mechanical and Aerospace Engineering, Cornell University — The modeling of molecular diffusion of chemical species is an important aspect of modeling turbulent reactive flows, especially for transported probability density function based methods. In this work, shadow-position mixing model (SPMM) is examined, using the DNS database of a temporally-evolving dimethyl ether jet flame undergoing local extinction and re-ignition. SPMM is similar to the conventional interaction by exchange with the mean (IEM) model, with the exception that there is an additional conditioning variable, the so-called "shadow displacement." Turbulent statistics and the shadow displacement are first extracted from the DNS database. Based on the position, time and shadow displacement, the conditional species diffusion from DNS and from SPMM are calculated and compared for several major and minor species. Possible values of model constants are then derived from the comparison of the conditional diffusion. Finally, the relation of SPMM with the IEM model, and the relation of SPMM with interaction by exchange with the conditional mean model, are explored and discussed.

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Date submitted: 01 Aug 2014 Electronic form version 1.4