Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

A Flamelet Modeling Approach for Multi-Modal Combustion with Inhomogeneous Inlets[1] BRUCE A. PERRY, Princeton Univ, MICHAEL E. MUELLER, Princeton University — Large eddy simulations (LES) of turbulent combustion often employ models that make assumptions about the underlying flame structure. For example, flamelet models based on both premixed and nonpremixed flame structures have been implemented successfully in a variety of contexts. While previous flamelet models have been developed to account for multi-modal combustion or complex inlet conditions, none have been developed that can account for both effects simultaneously. Here, a new approach is presented that extends a nonpremixed, two-mixture fraction approach for compositionally inhomogeneous inlet conditions to partially premixed combustion. The approach uses the second mixture fraction to indicate the locally dominant combustion mode based on flammability considerations and switch between premixed and nonpremixed combustion models as appropriate. To assess this approach, LES predictions for this and other flamelet-based models are compared to data from a turbulent piloted jet burner with compositionally inhomogeneous inlets, which has been shown experimentally to exhibit multi-modal combustion.

[1]This work was supported by the NSF Graduate Research Fellowship Program under grant DGE 1148900.

Bruce Perry
Princeton Univ

Date submitted: 29 Jul 2016 Electronic form version 1.4