Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

LES/PDF Modeling of Soot Evolution in Turbulent Flames VENKATRAMANAN RAMAN, The University of Texas at Austin, MICHAEL MUELLER, GUILLAUME BLANQUART, HEINZ PITSCH, Stanford University — Modeling soot evolution is turbulent flames is a complex problem due to the nonlinear interactions between the soot particles and the gas-phase turbulent combustion process. In this work, we develop a transported probability density function (PDF) approach for soot description in the context of large eddy simulation (LES) based combustion modeling. The soot number density is described using the bivariate VS (volume-surface) approach. The number density evolution equation is discretized using the hybrid method of moments technique, where the first four moments of the number density function are solved. In the transported PDF approach, the joint subfilter distribution of the gas-phase thermochemical scalars and the soot moments are evolved using a Lagrangian Monte-Carlo approach. The LES-PDF approach is validated using a piloted diffusion flame experiment. Results indicate that the PDF approach predicts delayed inception of soot particles and lower soot volume fraction as compared to the pure LES approach. While the soot volume fraction along the centerline of the jet is overpredicted by the simulation, the radial distribution is underpredicted as compared to the experiments. Further, the influence of mixing model on soot evolution is discussed.

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Date submitted: 07 Aug 2009 Electronic form version 1.4