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Large Eddy Simulation of a Sooting Jet Diffusion Flame MICHAEL MUELLER, GUILLAUME BLANQUART, HEINZ PITSCH, Stanford University — The understanding of soot particle dynamics in combustion systems is a key issue in the development of low emission engines. Key mean quantities of the population such as total volume fraction and number density can be predicted without solving for the entire distribution, by just solving for a few moments of the distribution. The newly developed Hybrid Method of Moments (HMOM) allows for an efficient and accurate prediction of moments of the soot Number Density Function (NDF). This method has been validated for laminar premixed and diffusion flames with detailed chemistry and is now implemented in a semi-implicit low Mach number Navier-Stokes solver. A Large Eddy Simulation (LES) of a piloted sooting jet diffusion flame (Delft flame) is performed to study the dynamics of soot particles in a turbulent environment. Combustion in the LES is modeled with the Flamelet/Progress Variable Approach (FPVA) to properly account for the effects of temperature on soot formation and growth. Profiles of temperature and major species as well as soot volume fraction are compared with experimental measurements. In addition, the influence of the turbulent environment on particle shape and size is investigated.

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