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A consistent transported PDF model for treating differential molecular diffusion HAIFENG WANG, PEI ZHANG, Purdue University — Differential molecular diffusion is a fundamentally significant phenomenon in all multi-component turbulent reacting or non-reacting flows caused by the different rates of molecular diffusion of energy and species concentrations. In the transported probability density function (PDF) method, the differential molecular diffusion can be treated by using a mean drift model developed by McDermott and Pope (Journal of Computational Physics, 226, 947-993, 2007). This model correctly accounts for the differential molecular diffusion in the scalar mean transport and yields a correct DNS limit of the scalar variance production. The model, however, misses the molecular diffusion term in the scalar variance transport equation, which yields an inconsistent prediction of the scalar variance in the transported PDF method. In this work, a new model is introduced to remedy this problem that can yield a consistent scalar variance prediction. The model formulation along with its numerical implementation is discussed, and the model validation is conducted in a turbulent mixing layer problem.

Haifeng Wang
Purdue University

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