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Performance assessment of a pre-partitioned adaptive chemistry approach in large-eddy simulation of turbulent flames[1] PERRINE PEPIOT, YOUWEN LIANG, ASHISH NEWALE, STEPHEN POPE, Cornell Univ — A pre-partitioned adaptive chemistry (PPAC) approach recently developed and validated in the simplified framework of a partially-stirred reactor is applied to the simulation of turbulent flames using a LES/particle PDF framework. The PPAC approach was shown to simultaneously provide significant savings in CPU and memory requirements, two major limiting factors in LES/particle PDF. The savings are achieved by providing each particle in the PDF method with a specialized reduced representation and kinetic model adjusted to its changing composition. Both representation and model are identified efficiently from a pre-determined list using a low-dimensional binary-tree search algorithm, thereby keeping the run-time overhead associated with the adaptive strategy to a minimum. The Sandia D flame is used as benchmark to quantify the performance of the PPAC algorithm in a turbulent combustion setting. In particular, the CPU and memory benefits, the distribution of the various representations throughout the computational domain, and the relationship between the user-defined error tolerances used to derive the reduced representations and models and the actual errors observed in LES/PDF are characterized.

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