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Simulation of Scalar Transport in a Non-Reacting Turbulent Jet using the Lattice Boltzmann Method CHONG WU, WAI LEE CHAN, Nanyang Technological University, Singapore — In this work, numerical simulations of a non-reacting turbulent jet was performed with a lattice Boltzmann (LB) solver that is based on the open-source Palabos framework. The computational domain consists of a square nozzle, from which a free jet of Reynolds number of 10,000 was injected into a three-dimensional, open quiescent space. A scalar distribution function was introduced to describe the mixture fraction, with its transport properties extracted from a flamelet library. Subgrid-scale turbulence was described by another independent distribution function that closes the Smagorinsky model. To this end, the LB simulations are being run to a statistically-steady state, from which results can be verified with analytical scaling of turbulence theories. Meanwhile, the scalar mixing profile at different axial locations will be investigated as it is critical to the implementation of flamelet-type combustion model. In addition, computational performance and simulation results of the LB method will be compared against that of large-eddy simulations, focusing in particular on the scalability of LB method.

Chong Wu
Nanyang Technological University, Singapore

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