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Flame Structure and Dynamics for an Array of Premixed Methane-Air Jets SIDDHARTH P. NIGAM, CAELAN LAPOINTE, JASON D. CHRISTOPHER, NICHOLAS T. WIMER, TORREY R. S. HAYDEN, GREGORY B. RIEKER, PETER E. HAMLINGTON, University of Colorado Boulder — Premixed flames have been studied extensively, both experimentally and computationally, and their properties are reasonably well characterized for a range of conditions and configurations. However, the premixed combustion process is potentially much more difficult to predict when many such flames are arranged in a closely spaced array. These arrays must be better understood, in particular, for the design of industrial burners used in chemical and heat treatment processes. Here, the effects of geometric array parameters (e.g., angle and diameter of jet inlets, number of inlets and their respective orientation) and operating conditions (e.g., jet velocities, fuel-air ratio) on flame structure and dynamics are studied using large eddy simulations (LES). The simulations are performed in OpenFOAM using multi-step chemistry for a methane-air mixture, and temperature and chemical composition fields are characterized for a variety of configurations as functions of height above the array. Implications of these results for the design and operation of industrial burners are outlined.

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