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Computational Investigation of Combustion Instability in a Gas Turbine Model Combustor NICHOLAS ARNOLD-MEDABALIMI, CHENG HUANG, KARTHIK DURAISAMY, University of Michigan — Gaseous combustion is expected to see continued use in propulsion and energy applications for the foreseeable future. Lean operating conditions are desired from an emissions standpoint but can lead to thermoacoustic instabilities. Gas Turbine Model Combustors (GTMC) have been investigated in recent years to improve our understanding of the underlying phenomena. A well-examined experimental design is that of Meier et al. investigated both at DLR and the University of Michigan. In this work, we perform reacting Large Eddy Simulations (LES) of this partially premixed swirl stabilized burner at various operating conditions with particular interest in thermoacoustically unstable regimes. Detailed validations are presented with experiments, and time-averaged field characteristics, acoustics, and coherent structures are examined. The impact of turbulent combustion closure models is examined by comparing the performance of finite-rate chemistry and flamelet based methods.

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