Abstract Submitted
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Modeling the Effects of Turbulence in Rotating Detonation Engines[1] COLIN TOWERY, KATHERINE SMITH, PETER HAMLINGTON, Turbulence and Energy Systems Laboratory, MARTHINUS VAN SCHOOR, Midé Technology, TESLA TEAM[2], MIDÉ TEAM[3] — Propulsion systems based on detonation waves, such as rotating and pulsed detonation engines, have the potential to substantially improve the efficiency and power density of gas turbine engines. Numerous technical challenges remain to be solved in such systems, however, including obtaining more efficient injection and mixing of air and fuels, more reliable detonation initiation, and better understanding of the flow in the ejection nozzle. These challenges can be addressed using numerical simulations. Such simulations are enormously challenging, however, since accurate descriptions of highly unsteady turbulent flow fields are required in the presence of combustion, shock waves, fluid-structure interactions, and other complex physical processes. In this study, we performed high-fidelity three dimensional simulations of a rotating detonation engine and examined turbulent flow effects on the operation, performance, and efficiency of the engine. Along with experimental data, these simulations were used to test the accuracy of commonly-used Reynolds averaged and subgrid-scale turbulence models when applied to detonation engines.

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