Abstract Submitted
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A Multi-Fidelity Surrogate Model for Handling Real Gas Equations of State[1] FREDERICK OUELLET, CHANYOUNG PARK, BERTRAND ROLLIN, S. "BALA" BALACHANDAR, Center for Compressible Multiphase Turbulence - Univ. of Florida — The explosive dispersal of particles is an example of a complex multiphase and multi-species fluid flow problem. This problem has many engineering applications including particle-laden explosives. In these flows, the detonation products of the explosive cannot be treated as a perfect gas so a real gas equation of state is used to close the governing equations (unlike air, which uses the ideal gas equation for closure). As the products expand outward from the detonation point, they mix with ambient air and create a mixing region where both of the state equations must be satisfied. One of the more accurate, yet computationally expensive, methods to deal with this is a scheme that iterates between the two equations of state until pressure and thermal equilibrium are achieved inside of each computational cell. This work strives to create a multi-fidelity surrogate model of this process. We then study the performance of the model with respect to the iterative method by performing both gas-only and particle laden flow simulations using an Eulerian-Lagrangian approach with a finite volume code. Specifically, the model's (i) computational speed, (ii) memory requirements and (iii) computational accuracy are analyzed to show the benefits of this novel modeling approach.

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