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Toward a Reactive Flow Model Calibration Methodology Using Streamline-Based Fast-Running Models MICHAEL CROCHET, University of Dayton Research Institute/AFRL, SUNHEE YOO, Torch Technologies/AFRL — Reactive flow models are a critical component used in hydrocodes to predict the behavior of energetic materials. The calibration of these models is often a time-consuming and computationally expensive process, requiring hundreds to thousands of simulation runs to obtain a single set of model parameters. To mitigate this expense, a technique informed by detonation shock dynamics (DSD) has been developed previously to determine the reactive rate model parameters, as an alternative to the use of hydrocodes during optimization. However, this method has some limitations in predicting important reaction zone flow field features, such as shock front corner turning. Here we explore the feasibility of a streamline-based approach to achieve flow field accuracy comparable to hydrocode simulations at a fraction of the expense. We first utilize the framework of Watt et al., where an existing set of ignition-and-growth (IG) parameters for a known explosive is used to predict detonation speed, flow field and shock front curvature, with results compared to DSD theory and experiments. The inverse problem is then discussed, where a new set of IG parameters is optimized to match experimentally-determined detonation speed and shock front geometry.

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