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Body-Fitted Detonation Shock Dynamics and the Pseudo-Reaction-Zone Energy Release Model CHAD MEYER, JAMES QUIRK, MARK SHORT, CARLOS CHQIUETE, Los Alamos National Laboratory — Programmed-burn methods are a class of models used to propagate a detonation wave, without the high resolution cost associated with a direct numerical simulation. They separate the detonation evolution calculation into two components: timing and energy release. The timing component is usually calculated with a Detonation Shock Dynamics model, a surface evolution representation that relates the normal velocity of the surface (D_n) to its local curvature. The energy release component must appropriately capture the degree of energy change associated with chemical reaction while simultaneously remaining synchronized with the timing component. The Pseudo-Reaction-Zone (PRZ) model is a reactive burn like energy release model, converting reactants into products, but with a conversion rate that is a function of the DSD surface D_n field. As such, it requires the DSD calculation produce smooth D_n fields, a challenge in complex geometries. We describe a new body-fitted approach to the Detonation Shock Dynamics calculation which produces the required smooth D_n fields, and a method for calibrating the PRZ model such that the rate of energy release remains as synced as possible with the timing component. We show results for slab, rate-stick and arc geometries.

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