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Calibrating chemical-diffusive model for multidimensional combustion properties XIAOYI LU, Texas AM University, CAROLYN KAPLAN, University of Maryland, ELAINE ORAN, Texas AM University — We present model developments and tests that calibrate the chemical-diffusive model (CDM) with respect its ability to to reproduce multidimensional detonation properties. The CDM is a parameter-fitting approach for incorporating heat release and diffusive processes into fluid dynamics simulations. Reaction parameters are optimized to reproduce global or one-dimensional properties of a laminar flame and a ZND detonation. This work first examines the dependence of detonation cell size on the CDM parameters in multidimensional simulations. The correlation between the detonation cell width and the half-reaction distance of the ZND structure is then incorporated into the CDM optimization process. It is shown that computed detonation cells, with the modified CDM, show the same sizes as those found in experimental measurements. Further tests will recalibrate the new Navier-Stokes CDM combination for computing the the deflagration-to-detonation transition. The objective is to produce a reacting-flow model that can be used with confidence for flame acceleration, DDT, and detonation propagation and quenching.

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