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Multidimensional detonation propagation modeled via nonlinear shock wave superposition ANDREW HIGGINS, NAVID MEHRJOO, McGill University — Detonation waves in gases are inherently multidimensional due to their cellular structure, and detonations in liquids and heterogeneous solids are often associated with instabilities and stochastic, localized reaction centers (i.e., hot spots). To explore the statistical nature of detonation dynamics in such systems, a simple model that idealizes detonation propagation as an ensemble of interacting blast waves originating from spatially random point sources has been proposed. Prior results using this model exhibited features that have been observed in real detonating systems, such as anomalous scaling between axisymmetric and two-dimensional geometries. However, those efforts used simple linear superposition of the blast waves. The present work uses a model of blast wave superposition developed for multiple-source explosions (the LAMB approximation) that incorporates the nonlinear interaction of shock waves analytically, permitting the effect of a more physical model of blast wave interaction to be explored. The results are suggestive of a universal behavior in systems of spatially randomized energy sources.

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