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On the development of Hydrogen-air detonations CHRISTOPHER ROMICK, University of Notre Dame, TARIQ ASLAM, Los Alamos National Laboratory, JOSEPH POWERS, University of Notre Dame — The development and propagation of Hydrogen-air detonations is examined. An initially quiescent stoichiometric mixture at 298.15 K and 1 atm is initialized using a hot spot similar in character to a spark. Several two-dimensional channel widths are examined to obtain greater insight into the effect that no-slip walls have on the formation process of the detonation. To model the phenomena, the compressive, reactive Navier-Stokes equations using detailed kinetics are used with multicomponent diffusion including Soret and DuFour effects. A chemical mechanism composed of 19 reversible reactions, containing 9 species and 3 elements is used for the kinetics model. The use of detailed kinetics gives rise to multiple length scales; to predict the full richness of the unsteady behavior of a detonation, all these scales must be resolved. Resolving the finest and larger scales is accomplished using the Wavelet Adaptive Multiresolution Representation (WAMR) technique. This adaptive mesh refinement technique has a high compression ratio of the number of points needed to accurately represent the flow versus an uniform grid. The time to the initial thermal explosion is examined for the various channel widths. Additionally, the long time sustainability of the detonation is studied.

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