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Nonlinear evolution equation for 1-D pulsating detonations with Fickett's model for reactive compressible flow, Influence of χ ANDRE BELLERIVE, JUSTIN TANG, MATEI RADULESCU, University of Ottawa — 1-D Asymptotic analysis on Fickett's model for reactive compressible flow, i.e Burgers' equation with an added reactive term. The model's simplicity is useful to identify the mechanisms that control the detonation stability. An induction-reaction, two-step, chain-branching reaction model is used. We assume a slowed time evolution based on the particle transit through the induction zone. The equation is derived for a high activation energy and a larger exothermic reaction layer than induction layer. The evolution equation is second order in time in the shock front velocity perturbation. The equation yields both stable and unstable solutions, the unstable solutions lead to high amplitude limit-cycles. The results show the stability boundary to be the activation energy times the ratio of induction time to reaction time, $\chi < CST$, at high activation energies. For larger reaction time to induction time the stability is only dependent on the activation energy, $\alpha < CST$. The stability boundary and unstable solutions agree with numerical simulation and are consistent with previous reactive Euler models.

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