Abstract Submitted
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Numerical Simulations of Detonation Instabilities and Magnetic Field Interactions[1] LORD COLE, HAI LE, ANN KARAGOZIAN, UCLA — Numerical simulations of magneto-hydrodynamic (MHD) effects on high frequency and low frequency one-dimensional detonation wave instabilities are performed, with applications to flow control and MHD thrust augmentation in Pulse Detonation Engines and their design variations.[2] The dynamics of the hydrogen-air detonation are explored via high order shock capturing schemes and complex reaction kinetics. The flame is initially strongly coupled to the shock and the wave is over-driven. As the degree of overdrive decays and the detonation approaches the CJ limit, high frequency instabilities begin to appear. Eventually the average induction length continues to increase and a second mode can be seen which directly couples the flame speed with the shock, resulting in fluctuations with lower frequency but much higher amplitude. A simple model for flame-shock coupling replicates the quantitative features of these instabilities quite well. Effects of an externally applied magnetic field on these detonation instabilities are explored. In addition, the complex chemical kinetics calculations are ported onto a GPU, and computational performance may be compared with standard CPU-based computations.

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[2]Zeineh, et al., **J. Propusion & Power**, to appear

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