Abstract Submitted
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Autoignition of hydrogen and air using direct numerical simulation[1] JEFFREY DOOM, KRISHNAN MAHESH, University of Minnesota — Direct numerical simulation (DNS) is used to study to auto–ignition in laminar vortex rings and turbulent diffusion flames. A novel, all–Mach number algorithm developed by Doom et al (*J. Comput. Phys.* 2007) is used. The chemical mechanism is a nine species, nineteen reaction mechanism for H_2 and Air from Mueller at el (*Int. J. Chem. Kinet.* 1999). The vortex ring simulations inject diluted H_2 at ambient temperature into hot air, and study the effects of stroke ratio, air to fuel ratio and Lewis number. At smaller stroke ratios, ignition occurs in the wake of the vortex ring and propagates into the vortex core. At larger stroke ratios, ignition occurs along the edges of the trailing column before propagating towards the vortex core. The turbulent diffusion flame simulations are three–dimensional and consider the interaction of initially isotropic turbulence with an unstrained diffusion flame. The simulations examine the nature of distinct ignition kernels, the relative roles of chemical reactions, and the relation between the observed behavior and laminar flames and the perfectly stirred reactor problem. These results will be discussed.

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Jeffrey Doom
University of Minnesota

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