Abstract Submitted
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Spark ignition of aviation fuel in isotropic turbulence[1] ALEX KRISMAN, Sandia National Laboratories, Livermore, TIANFENG LU, Universtiy of Connecticut, GIULIO BORGHESI, JACQUELINE CHEN, Sandia National Laboratories, Livermore — Turbulent spark ignition occurs in combustion engines where the spark must establish a viable flame kernel that leads to stable combustion. A competition exists between kernel growth, due to flame propagation, and kernel attenuation, due to flame stretch and turbulence. This competition can be measured by the Karlovitz number, Ka, and kernel viability decreases rapidly for $Ka \gg 1$. In this study, the evolution of an initially spherical flame kernel in a turbulent field is investigated at two cases: Ka_- ($Ka = 25$) and Ka_+ ($Ka = 125$) using direct numerical simulation (DNS). A detailed chemical mechanism for jet fuel (Jet-A) is used, which is relevant for many practical conditions, and the mechanism includes a pyrolysis sub-model which is important for the ignition of large hydrocarbon fuels. An auxiliary non-reacting DNS generates the initial field of isotropic turbulence with a turbulent Reynolds number of 500 (Ka_-) and 1,500 (Ka_+). The kernel is then imposed at the center of the domain and the reacting DNS is performed. The Ka_- case survives and the Ka_+ case is extinguished. An analysis of the turbulence chemistry interactions is performed and the process of extinction is described.

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