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Acoustic timescale characterization of hot spot ignition in thermally stratified mixtures FYNN REINBACHER, JONATHAN REGELE, Iowa State University — Thermal stratification and the formation of hot spots in reactive mixtures are of key interest to characterize the autoignition behavior of charges in internal combustion engines. Critical gradient conditions and local maximum sizes of a finite hot spot centers can be used to describe such a hot spot. In previous work, one- and two-dimensional hot spots consisting of a linear temperature gradient and constant plateau have been characterized on an acoustic timescale. In the present work, random one-dimensional temperature fields, derived from Fourier superposition for temperature fluctuations with a temperature spectrum similar to Passot-Pouquet kinetic energy spectrum, are analyzed. The linear gradient constant plateau model is compared to a more realistic hot spot temperature profile. Hot spots in the one-dimensional temperature fields are modeled with linear gradients and constant plateaus in order to be characterized with acoustic time scale analysis. Probability distributions for different excitation-to-acoustic timescale ratios are calculated for a range of engine conditions.

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