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Lyapunov spectrum in turbulent combustion MALIK HASSANALY, VENKAT RAMAN, Univ of Michigan - Ann Arbor — Transient flame evolution is an important flow problem for many practical applications (for example high-altitude relight, ignition in internal combustion engines, unstart in scramjets). Current approaches to combustion modeling utilize assumptions that are valid mainly for statistically stationary processes. In order to understand the transient problem, a dynamic systems approach is followed here. The propagation of a flame in a turbulent channel flow is used as a canonical turbulent combustion system and is analyzed with the Lyapunov theory. In particular, the Lyapunov spectrum for this flow is computed using multiple coordinated simulations. For a range of flow conditions, dimensionality of the state-space is determined. It is shown that the internal structure of the flame plays a critical role in determining the response of the system to perturbations in the flow.

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