

Abstract Submitted
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The nonlinear behaviour of a ducted premixed flame¹ KARTHIK KASHINATH, IAIN WAUGH, University of Cambridge, SANTOSH HEMCHANDRA, Indian Institute of Science, MATTHEW JUNIPER, University of Cambridge — Nonlinear thermoacoustic oscillations are one of the most challenging problems in premixed gas turbine engine combustors. We investigate the nonlinear thermoacoustic behaviour of a ducted premixed flame using time domain analyses of the fully coupled thermoacoustic system. Nonlinear time series analysis tools are used to analyse the complex oscillations that the system exhibits. The system shows periodic, quasi-periodic, frequency-locked and chaotic oscillations depending on the operating condition. While such behaviour has been observed in experiments (Kabiraj et. al., Chaos 22, 023129 (2012)), this is the first attempt at modelling this system using an approach that captures the details of the flame front dynamics. The bifurcations of the system for changes in operating conditions are studied for a few different control parameters such as the flame equivalence ratio, geometry of the system and mean flow velocity. Furthermore, a route to chaos is identified in this system.

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Karthik Kashinath
University of Cambridge

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