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Intermittency route to chaos in a self-excited thermoacoustic system[1] YU GUAN, Hong Kong University of Science and Technology, VIKRANT GUPTA, Southern University of Science and Technology, LARRY K.B. LI, Hong Kong University of Science and Technology — In nonlinear dynamics, there are three classic routes to chaos, namely the period-doubling route, the Ruelle–Takens–Newhouse route and the intermittency route. The first two routes have previously been observed in self-excited thermoacoustic systems, but the third has not. In this experimental study, we present evidence of the intermittency route to chaos in the self-excited regime of a prototypical thermoacoustic system – a Rijke tube powered by a laminar premixed flame. We identify the intermittency to be of type II from the Pomeau–Manneville scenario through an analysis of (i) the probability distribution of the quiescent epochs between successive bursts of chaos, (ii) the first return map, and (iii) the recurrence plot. By establishing the last of the three classic routes to chaos, this study strengthens the universality of how strange attractors arise in self-excited thermoacoustic systems, paving the way for the application of generic suppression strategies based on chaos control.

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