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Experimental sensitivity analysis and control of thermoacoustic systems MATTHEW JUNIPER, NICHOLAS JAMIESON, University of Cambridge, LARRY LI, Hong Kong University of Science and Technology, GEORGIOS RIGAS, University of Cambridge — We report the results of an experimental sensitivity analysis on a thermoacoustic system: an electrically heated Rijke tube. We measure accurately the change of the linear stability characteristics of the system, quantified as shifts in the growth rate and oscillation frequency, that is caused by the introduction of a passive control device. In the case presented here, the control device is a mesh, which causes drag in the system. The rate of growth is slow, so the growth rate and frequency can be measured over many hundred cycles in the linear regime with and without control. This means that the shift in growth rate and frequency can be calculated very accurately. These measurements agree well with the theoretical predictions from adjoint-based methods of Magri & Juniper (JFM 2013, 719, 183-202). The results suggest that adjoint-based methods can accurately predict the effect of different passive control devices on the stability of a thermoacoustic system, opening new avenues for the development, implementation and validation of control strategies for more complex thermoacoustic systems.

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