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Summary: In jet engines and gas turbines, the annular shape of the combustion chamber allows the appearance of self-oscillating azimuthal thermoacoustic modes. We report experimental evidence of a new type of modal dynamics characterised by periodic switching of the spinning direction and develop a theoretical model that fully reproduces this phenomenon and explains the underlying mechanisms. It is shown that tiny asymmetries of the geometry, the mean temperature field, the thermoacoustic response of the flames or the acoustic impedance of the walls, present in any real systems, can induce these heteroclinic orbits. The model also explains experimental observations showing a statistically dominant spinning direction despite the absence of swirling flow, or pairs of preferred nodal line directions.

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References:


