

Abstract Submitted
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Weakly nonlinear manipulation of unstable swirling flames

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— Swirling flames are often prone to precessing instabilities with an azimuthal wavenumber of $m = -1$. We explore the manipulation and response behavior from an axisymmetric, external, harmonic driving by employing a weakly nonlinear framework for the interaction of the forcing and the flame's preferred response. A compact and efficient formulation of the underlying governing equations will be presented that involves Jacobian, Hessian and higher-order terms of a multi-valued Taylor expansion to arrive at a coupled Landau-type amplitude equation. This weakly nonlinear system will be investigated for its potential to suppress inherent precessing instabilities by axisymmetric open-loop control. The weakly nonlinear formalism captures selected wavenumber interactions as well as dominant finite-amplitude effects, while still avoiding the full treatment of nonlinear processes.

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