

Abstract Submitted
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Exploring the Spatiotemporal Dynamics of Covariant Lyapunov Vectors for Chaotic Convection¹ MU XU, MARK PAUL, Virginia Tech — Covariant Lyapunov vectors provide access to fundamental features of chaos in high-dimensional systems that are driven far-from-equilibrium. We explore the spatiotemporal dynamics of covariant Lyapunov vectors for chaotic Rayleigh-Bénard convection to provide new physical insights. We use the covariant Lyapunov vectors to quantify the transition from hyperbolic to non-hyperbolic dynamics, to determine the degree of Oseledec splitting exhibited by the dynamics, and to shed light upon upon the tangled nature of the Lyapunov vectors. In this talk, we will explore the spatiotemporal dynamics of the Lyapunov vectors and their relation with the chaotic pattern dynamics of the flow field. Our results suggest that the Lyapunov vectors contain two distinct spatiotemporal features consisting of highly localized regions near defect structures and a spatially distributed checkerboard pattern. We will explore the connection between these features and the ideas of physical and spurious modes that may compose the dynamics.

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