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Quantifying Spatiotemporal Chaos in Rayleigh-Benard Convection: Using Numerics to Connect Theory and Experiment MU XU, Virginia Tech, ALIREZA KARIMI, University of Notre Dame, JEFFREY TITHOF, Georgia Institute of Technology, MIRO KRAMAR, VIDIT NANDA, Rutgers University, MICHAEL SCHATZ, Georgia Institute of Technology, KONSTANTIN MISCHAIKOW, Rutgers University, MARK PAUL, Virginia Tech — Spatiotemporal chaos is a common and important feature of spatially-extended systems that are driven far-from-equilibrium. Many open questions remain regarding the high-dimensional chaotic dynamics that describe fluid systems for laboratory conditions. In this talk we explore the spiral defect chaos state of Rayleigh-Benard convection. Recent advances in computing algorithms and available supercomputing resources have made possible the computation of fundamentally important quantities of theoretical importance that are currently inaccessible to experiment. For example, the temporal variation of the spectrum of Lyapunov exponents, the spatial and temporal variation of the Lyapunov vectors, and the variation of the fractal dimension with system parameters. We use large-scale parallel numerical simulations to compute theoretically important diagnostics of spatiotemporal chaos, such as these, with particular interest in connecting these numerical results with experimentally accessible quantities that describe the pattern dynamics.

Mu Xu
Virginia Tech

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