Quantifying spatiotemporal chaos in Rayleigh-Benard convection

MAGNUS EINARSSON, Virginia Tech, M.R. PAUL, Virginia Tech, P.F. FISCHER, Argonne National Laboratory — One of the biggest challenges of modern science is to gain further understanding of large spatially extended systems driven far-from-equilibrium. Such systems often exhibit spatiotemporal chaos yielding aperiodic behavior in both space and time that is difficult to characterize. Diagnostics based upon the Lyapunov exponents and eigenvectors are explored as a way to quantify spatiotemporal chaos in Rayleigh-Benard convection in an experimentally realistic cylindrical domain. This is done through large-scale parallel numerical simulations and the results are used to gain new physical insight into the behavior of spatiotemporal chaotic systems.

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