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Role of Instability in State and Parameter Estimation of Rayleigh-Bénard Convection[1] ADAM PERKINS, MICHAEL SCHATZ, Georgia Institute of Technology — Predictive power in spatiotemporally complex systems is limited by several factors. Foremost among them is inherent system instability that can cause small initial uncertainty to grow rapidly. We address this issue in a Rayleigh-Bénard convection experiment, in which a novel technique of pattern control provides a tool for the repeatable imposition of a given convection pattern, e.g., a pattern near instability. Selected perturbations are applied to the reference pattern to create an ensemble of systems evolving from nearby initial conditions on both sides of the instability boundary. We employ an efficient forecasting algorithm, the Local Ensemble Transform Kalman Filter (LETKF), to produce system state and parameter estimates from the convection patterns observed experimentally. Preliminary results of applying this state estimation algorithm to diverging pattern trajectories will be discussed.

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