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Jared P Whitehead* (whitehead@mathematics.byu.edu). *Data Assimilation in Large Prandtl Rayleigh-Benard Convection from Thermal Measurements.*

This work applies a continuous data assimilation scheme—a framework for reconciling sparse and potentially noisy observations to a mathematical model—to Rayleigh–Benard convection at infinite or large Prandtl numbers using only the temperature field as observables. These Prandtl numbers are applicable to the earth’s mantle and to gases under high pressure. We rigorously identify conditions that guarantee synchronization between the observed system and the model, then confirm the applicability of these results via numerical simulations. Our numerical experiments show that the analytically derived conditions for synchronization are far from sharp; that is, synchronization often occurs even when sufficient conditions of our theorems are not met. We also develop estimates on the convergence of an infinite Prandtl model to a large (but finite) Prandtl number generated set of observations. Numerical simulations in this hybrid setting indicate that the mathematically rigorous results are accurate, but of practical interest only for extremely large Prandtl numbers. (Received September 15, 2020)