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Active transport in chaotic Rayleigh-Bénard convection CHRISTOPHER MEHRVARZI, MARK PAUL, Virginia Polytechnic Institute and State University — The active transport of a scalar species is studied numerically in a spatiotemporally chaotic flow field of Rayleigh-Bénard convection. There has been significant progress both theoretically and experimentally in understanding characteristics of active transport in steady periodic-flows such as a ring of vortices and other two-dimensional flows. In this work we are interested in the reaction-advection-diffusion of a scalar species in a three-dimensional chaotic flow field that is accessible to the laboratory. We study the transport using a highly efficient and parallel spectral element approach to simultaneously evolve the Boussinesq and reaction-advection-diffusion equations in large aspect-ratio cylindrical domains with experimentally relevant boundary conditions. We choose the system parameters to yield advection, reaction, and diffusion time scales that are comparable and investigate their interactions. We explore the effect of the chaotic convection patterns on the transport characteristics and quantify the reaction front speed and front geometry for a range of parameters.

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