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Structure and Stability of High Rayleigh-Number Periodic-Orbit Solutions in Porous Medium Convection BAOLE WEN, GREGORY CHINI, JOHN GIBSON, University of New Hampshire — Direct numerical simulations (DNS) indicate that the instantaneous flow in buoyancy-driven porous medium convection self-organizes into recurring quasi-coherent structures, suggesting that the basic physics can be understood in terms of these "building blocks" and the patterns they form. In this investigation, we use a Newton-hookstep searching algorithm to compute numerically-exact time-periodic (i.e. periodic orbit) solutions to the porous medium convection problem in small laterally-periodic domains at extreme values of the Rayleigh number. Four types of periodic-orbit solutions with different symmetries are presented, and their periods, stability, and heat-transport properties are quantified. Our results confirm that the periodic orbits capture many features of typical quasi-coherent structures observed in DNS of "turbulent" porous medium convection.

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