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Bifurcation phenomena in cylindrical convection LAURETTE TUCKERMAN, PMMH-ESPCI-CNRS, France, K. BORONSKA, University of Leeds, United Kingdom, L. BORDJA, University of Jijel, Algeria, L. MARTIN-WITKOWSKI, LIMSI-CNRS, France, M.C. NAVARRO, University of Castilla-La Mancha, Spain — We present two bifurcation scenarios occurring in Rayleigh-Benard convection in a small-aspect-ratio cylinder. In water (Pr=6.7) with R/H=2, Hof et al. (1999) observed five convective patterns at Ra=14200. We have computed 14 stable and unstable steady branches, as well as novel time-dependent branches. The resulting complicated bifurcation diagram, can be partitioned according to azimuthal symmetry. For example, three-roll and dipole states arise from an m=1 bifurcation, four-roll and "pizza" branches from m=2, and the "mercedes" state from an m=3 bifurcation after successive saddle-node bifurcations via "marigold", "mitsubishi" and "cloverleaf" states. The diagram represents a compromise between the physical tendency towards parallel rolls and the mathematical requirement that primary bifurcations be towards trigonometric states. Our second investigation explores the effect of exact counter-rotation of the upper and lower bounding disks on axisymmetric flows with Pr=1 and R/H=1. The convection threshold increases and, for sufficiently high rotation, the instability becomes oscillatory. Limit cycles originating at the Hopf bifurcation are annihilated when their period becomes infinite at saddle-node-on-periodic-orbit (SNOPER) bifurcations.

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