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Axially periodic Rayleigh-Bénard convection in a cylindrical cell LAURA SCHMIDT, University of Twente, The Netherlands, FEDERICO TOSCHI, Technische Universiteit Eindhoven, The Netherlands, ROBERTO VERZICCO, University of Rome - Tor Vergata, Italy, DETLEF LOHSE, University of Twente, The Netherlands — Numerical simulations of Rayleigh-Bénard convection in an infinite cylindrical cell show that despite the restriction of velocity and temperature fluctuations due to the side walls, the system approaches the ultimate regime of thermal convection as the Rayleigh number (Ra) is increased. Here, Ra is defined based on the underlying linear temperature gradient which is driving the convection. This periodic system has exact solutions composed of modes of exponentially growing vertical velocity and temperature fields. In the low Ra regime these solutions dominate the dynamics and lead to very high and unsteady heat transfer. As Ra is increased, interaction between these modes stabilizes the system, evidenced by the increasing homogeneity and reduced fluctuations in the r.m.s. velocity and temperature fields.

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