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Thermal convection in a co-rotating cylindrical annulus[1] CHANG-WOO KANG, ANTOINE MEYER, INNOCENT MUTABAZI, Normandie Universite — We investigate thermal convection in a fluid of thermal expansion coefficient α, kinematic viscosity ν, thermal diffusivity κ in a cylindrical annulus of inner radius a and outer radius $b$with a solid body rotation of angular frequency Ω and an inward heating with a temperature difference ΔT. The control parameters are η = a/b, Pr = ν/κ and the Rayleigh number Ra = $\alpha\Delta$T gd$^3/\nu\kappa$ where the centrifugal gravity $g_c = \Omega^2$(a+b)/2. We adopt the generalized Boussinesq approximation. Linear stability analysis shows that for infinite annulus, the threshold Ra_c decreases with η and tends to the value Ra_c =1708 when $\eta \to 1$ and that critical modes are columnar vortices. Direct numerical simulations using periodic boundary conditions in the axial direction, show that the columnar vortices appear via a supercritical bifurcation. Higher modes of columnar vortices have been determined using the frequency spectra and the Nusselt number for Pr=1 and η = 0.5: drifting vortices, vacillation modes and chaotic modes have been identified from Ra=1700 to Ra=10^7 The contribution of the centrifugal buoyancy to the variation of the kinetic energy in the flow is analysed.

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