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Direct numerical simulation of vacillation in convection induced by centrifugal buoyancy[1] DIOGO B. PITZ, OLAF MARXEN, JOHN W. CHEW, University of Surrey — Flows induced by centrifugal buoyancy occur in industrial systems, such as in the compressor cavities of gas turbines, as well as in flows of geophysical interest. In this numerical study we use direct numerical simulation (DNS) to investigate the transition between the steady waves regime, which is characterized by great regularity, to the vacillation regime, which is critical to understand transition to the fully turbulent regime. From previous work it is known that the onset of convection occurs in the form of pairs of nearly-circular rolls which span the entire axial length of the cavity, with small deviations near the parallel, no-slip end walls. When non-linearity sets in triadic interactions occur and, depending on the value of the centrifugal Rayleigh number, the flow is dominated by either a single mode and its harmonics or by broadband effects if turbulence develops. In this study we increase the centrifugal Rayleigh number progressively and investigate mode interactions during the vacillation regime which eventually lead to chaotic motion.

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