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Reduced models to study Rayleigh-Benard convection in cylindrical geometry MARIA CRUZ NAVARRO, Universidad de Castilla- La Mancha, Spain, LAURENT MARTIN WITKOWSKI, LIMSI-CNRS, France, LAURETTE TUCKERMAN, PMMH-ESPCI-CNRS, France, PATRICK LE-QUERE, LIMSI-CNRS, France — We propose to study Rayleigh-Benard convection instabilities in a cylinder of aspect ratio one. The isothermal disks hot (at the bottom) and cold (on the top) turn at the same angular velocity but in the opposite direction. Three numerical techniques are used: (i) temporal integration, (ii) a study of the eigenvalues from the linearized system (Newton/Arnoldi), (iii) a projection of Navier-Stokes equations on a limited number of eigenvectors reducing the system to a few ordinary differential equations. At this state of development, only the study of linear stability (ii) takes into account non-axisymmetric modes. In absence of rotation, the first bifurcation is axisymmetric. The rotation of the disks has the effect of delaying the transition towards convection for both axisymmetric and non-axisymmetric modes, although there is a critical rotation velocity value for which the flow becomes three-dimensional. Restricting to axisymmetric mode, the non-linear dynamic is rich when varying the temperature difference between disks and their angular velocity. The goal of our work is to check the ability of reduced models to capture such dynamic by comparing technique (i) with technique (iii).

Maria Cruz Navarro
Universidad de Castilla- La Mancha

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