Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Complex patterns in rotating Rayleigh-Bénard convection. ERIC SERRE, CNRS-Marseille, JOSÉ-JOAQUIM SANCHEZ-ALVAREZ, EMILIA CRESPO DEL ARCO, UNED-Madrid, FRIEDRICH BUSSE, University of Bayreuth — Flows induced by thermal buoyancy in rotating systems play an important role in many industrial processes as well as in numerous problems in geophysical and astrophysical fluid dynamics. Thermal convection in a horizontal fluid layer heated from below and rotating about a vertical axis has also become a prime example in theories of pattern formation and of the transition to spatio-temporal chaos. The Küppers-Lortz instability occurs in a rotating Rayleigh-Bénard convection and is a paradigmatic example of spatiotemporal chaos [G. Küppers and D. Lortz, J. Fluid Mech. 35, 609 (1969)]. Surprisingly and contrary to this established scenario, Bajaj et al. 1998 [K. Bajaj, et al., Phys. Rev. Lett. 81 (1998)] observed experimentally in a cylinder square patterns in the range of parameters where Küppers-Lortz instability was expected. In this work we study numerically square patterns properties by taking into account realistic boundary conditions. The Navier-Stokes and heat transport equations have been solved in the Oberbeck-Boussinesq approximation using an efficient pseudo-spectral technique. All the characteristics of the pattern show that it appears when the flow is laterally confined.

Eric Serre
CNRS

Date submitted: 28 Jul 2005 Electronic form version 1.4