# ICTS Seminar

Title : Transient Convective Spin Up Dynamics

Speaker : S.Ravichandran, Nordic Institute for Theoretical Physics (NORDITA), Stockholm

Date : Tuesday, December 3, 2019

Time : 3:30 PM

Venue : Emmy Noether Seminar Room

Abstract : We study numerically the formation and breakdown of transient axisymmetric rings of up- and down-welling fluid in impulsively started rotating Rayleigh Benard convection. First observed in laboratory experiments with constant negative heat flux at the top boundary [1-3], these rings form during spin-up for a range of Taylor and Rossby (or flux Rossby) numbers, eventually breaking down into a grid of cyclonic vortices with descending flow surrounded by slowly ascending flow. The formation and longevity of the rings depends on the Prandtl number Pr, with no sustained rings forming for Pr < Pr_c (Ta, Ro). Furthermore, in the rapidly rotating regime and for the Rayleigh numbers O(10^5 − 10^6 ) considered here, we find that the boundary conditions on the top and bottom surfaces influence the ring dynamics and their breakdown. With Dirichlet conditions the rings are less stable than for corresponding Neumann conditions, breaking down into sheet-like structures instead of individual vortices. The distinction resides in the nature of the stability of the upper boundary layer.

References:

[1] B. M. Boubnov and G. S. Golitsyn, J. Fluid Mech. 167, 503 (1986).
[2] P. Vorobieff and R. E. Ecke, Phys. Fluids 10, 2525 (1998).
[3] J-Q. Zhong, M.D. Patterson and J.S. Wettlaufer, Phys. Rev. Lett. 105, 044504 (2010)