ICTS Seminar

Title   :   Patterns near the onset of convection in rotating Rayleigh-Bénard convection with slow rotation

Speaker   :   Priyanka Maity, Indian Institute of Technology Kharagpur, West Bengal

Date   :   Monday, February 20, 2017

Time   :   2:00 PM

Venue   :   Emmy Noether Seminar Room, ICTS Campus, Bangalore

Abstract   :   Rayleigh-Bénard convective (RBC) systems, a simplified system to study thermal convection in fluids, show a rich variety of pattern forming instabilities and bifurcations. The dynamics of rotating Rayleigh-Bénard convection (RBC) is characterized by three dimensionless numbers: Rayleigh number Ra, which is a measure of force of buoyancy; Taylor number Ta which is a measure of dimensionless rotation rates and Prandtl number Pr which is the ratio of two diffusive time scales. We have investigated pattern formation and associated bifurcations in low-Prandtlnumber fluid ($Pr = 0$ and $Pr = 0.025$) with slow rotation in the system. Slightly above the onset, we observed homoclinic bifucation in absence of rotation and studied the effect of Coriolis force on the patterns. The presence of Coriolis force introduces simultaneous gluing and ungluing bifurcation in the system. Just at the onset of convection, we observed relaxation oscillations. We have also constructed couple of low-dimensional models which captures the dynamics near the onset of convection qualitatively. These models are then used to confirm the presence of bifurcations in the system. These models also explains the transition from a chaotic onset in absence of rotation to a periodic onset in presence of rotation.