



ICTS Fluid Seminar (HYBRID)

Title : Geostrophic turbulence and the formation of large scale structure

Speaker : Edgar Knobloch (University of California, Berkeley)

Date : Thursday, 03rd August, 2023

Time : 11:00 AM (IST)

Abstract : Low Rossby number convection is studied using an asymptotically reduced system of equations valid in the limit of strong rotation. The equations describe four regimes as the Rayleigh number Ra increases: a disordered cellular regime near threshold, a regime of weakly interacting convective Taylor columns at larger Ra , followed for yet larger Ra by a breakdown of the convective Taylor columns into a disordered plume regime characterized by reduced heat transport efficiency, and finally by a new type of turbulence called geostrophic turbulence. Properties of this state will be described and illustrated using direct numerical simulations of the reduced equations. These simulations reveal that geostrophic turbulence is unstable to the formation of large scale barotropic vortices or jets, via a process known as spectral condensation. The details of this process will be quantified and its implications explored. The results are corroborated via direct numerical simulations of the Navier-Stokes equations; in the presence of boundaries robust boundary zonal flows resembling topologically protected edge states in chiral systems are present. These flows are associated with a substantial increase in the Nusselt number and their suppression is therefore of paramount importance for laboratory studies of geostrophic turbulence. A simple laboratory intervention achieving this will be described.

Venue : **Offline:** Feynman Lecture Hall (ICTS)

Online: Please click the below link to join the seminar.

<https://icts-res-in.zoom.us/j/81797960341?pwd=aEZjU2gvVWtXNVlQQVh3ckg0TGh2Zz09>

Meeting ID: 817 9796 0341

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