

ICTS PhD Synopsis Seminar

Title : Turbulence Suppression and Onset in Stratified Flows

Speaker : Ritabrata Thakur, ICTS-TIFR, Bangalore

Date : Friday, May 29, 2020

Time : 02:30 PM

Venue : Online seminar (Please use this link to join the seminar - <https://guest.livesize.com/672942>. Google chrome is preferred)

Abstract : The Bay of Bengal has the lowest-salinity surface waters in the tropical ocean due to river runoff and seasonal rainfall, and is an active 'communicator' with the Indian monsoon. We study the role of this low-salinity water in modulating subsurface turbulence and elaborate on the seasonal nature and the depth penetration of geophysical turbulence using data of over a year. The mixing of subsurface heat by turbulence in the Bay is of importance to understand its feedback to the Indian monsoon and vice-versa. We find that the Bay shows a prolonged and surprising suppressed phase of geophysical turbulence and we have a preliminary understanding of it using linear stability.

In the second part of the talk, we will discuss the development of a generalised non-linear fluid stability theory and numerics for viscosity stratified shear flows. We revisit the fundamental problem of laminar-turbulence transition at subcritical Reynolds number in stratified flows. We show that the fully nonlinear viscosity stratified flow in a channel admits non-modal energy growth at intermediate times which is required for this kind of a transition. Surprisingly, the optimal structure that maximises this growth is localised on the hotter (lower viscosity) wall. We calculate the shape of this optimal using a recently developed numerical technique of direct-adjoint looping. We see that nonlinearity suppresses this energy growth.