ICTS Fluid Dynamics Seminar

Title : Disentangling emergent and recursive turbulence coherent structures via generalized correlation-decomposition

Speaker : Siddhartha Mukherjee (IIT Kanpur, Uttar Pradesh)

Date : Friday, 06 December 2024

Time : 11:30 AM (IST)

Abstract : Turbulence and its organization, long conceptualized in terms of "coherent structures" has resisted clear description, largely due to a lack of tools to identify instantaneous, spatially finite structures, while unraveling them from superposition. We present generalized correlations coupled with Helmholtz-decomposition as a paradigm to identify and disentangle structures. Apart from the well known vorticity-jets surrounded by swirling velocity, we find high kinetic energy velocity-jets. Biot–Savart decomposition shows that the velocity-jets are neither self-induced, nor induced by the strong vorticity, but almost entirely induced, non-locally, by the permeating intermediate range vorticity. Velocity-swirls are a superposition of self-induced and background-induced contributions. Our work suggests that turbulence organization could result from non-local and non-linear field interactions - coherence in one field may be an "echo" of coherence elsewhere in the gradient fields, and so on recursively - leading to an emergent description, unlike the notion of a strict structural hierarchy envisioned in the "cascade".

Venue : Emmy Noether Seminar Room
Zoom Link: https://icts-res-in.zoom.us/j/96237019600?pwd=4uTzEElYkWLILZrQaxhKagVcukSbza.1
Meeting ID: 962 3701 9600
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