



## ICTS Astrophysics & Relativity / Fluid Dynamics Seminar

**Title** : Physics of Turbulent Radiative Mixing Layers

**Speaker** : Prateek Sharma (Indian Institute of Science, Bengaluru)

**Date** : Friday, 13 March 2026

**Time** : 11:30 AM (IST)

**Abstract** : Turbulent radiative mixing layers arise when hot and cold gas interact through shear in the presence of cooling and are central to the formation of multiphase structure in astrophysical environments such as the circumgalactic medium. Despite extensive numerical work, their internal structure and energy balance remain unsettled. Using high-resolution simulations together with a Reynolds-decomposed analysis of momentum and energy transport, we identify a robust quasi-steady structure that emerges in the strong-cooling regime. Upstream gas cools and compresses before streamwise momentum is fully mixed, generating a compressive Reynolds stress that modifies vertical force balance. Radiative losses are offset primarily by enthalpy flux divergence, with turbulent heat transport playing a subdominant role. We further show that the cooling-rate surface density saturates at large domain size, resolving previous discrepancies. These results provide a physically transparent framework for turbulent mixing with cooling and have potential applications beyond astrophysics, including geophysical and stratified shear flows.

**Venue** : Emmy Noether Seminar Room

Zoom Link: <https://icts-res-in.zoom.us/j/92722447470?pwd=njkX19mEW8XCfaeYF9zUoUjV7nZO.1>

Meeting ID: 927 2244 7470

Passcode: 442789