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TATA INSTITUTE OF FUNDAMENTAL RESEARCH

ICTS M.Sc Project Seminar

Title : Impact of the Basset History Force on Inertial Particle Dynamics in a Taylor-Green Vortex Flow

Speaker : Shasvat Venkata Vudumula (ICTS-TIFR, Bengaluru)

Date : Tuesday, 29 April 2025

Time : 2:00 PM (IST)

Abstract : We investigate how the often ignored Basset history force alters inertial particle motion in a steady Taylor-Green vortex. High-resolution simulations integrate the full Maxey-Riley-Gatignol equation with an efficient RK-XTD scheme and compare the results with a Stokes-only variant that omits the non-local Basset term. Trajectories are tracked to nondimensional time $T = 150$ across a broad Stokes number range for light ($R = 1.1$) and heavy ($R = 1000$) particles. The history force removes the permanent vortex trapping predicted by simplified models and measurably reshapes dispersion at $T = 150$, with sensitivity to both density ratio and inertia. For many cases, paths remain intricate yet non-trapped, diverging markedly from Stokes-only behaviour. The results demonstrate that retaining the Basset force is essential for reliable forecasts of particle distribution over finite timescales.

Venue : Online

Zoom Link: <https://icts-res-in.zoom.us/j/93338316562?pwd=4THobMblbzeTVyYlZfbtdUuw926Owg.1>

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