Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Webinar

Linear stability and numerical studies of interfacial and buoyancy-driven bubbly flows

Rashmi Ramadugu

TCIS, Hyderabad

Multiphase flows are ubiquitous in nature (e.g. rainfall, blood flow in the body, magma flow, dispersion of pollutants) and in industrial processes (in power plants, oil and gas industries). Bubble suspensions, antibubbles and particle-laden flows occur in both. These flows display a wide variety of instabilities, and surface tension most often stabilises them. In three dimensions, surface tension can occasionally destabilise the flow (while acting to minimise the interface area). In this talk, first, I will discuss a counterintuitive role for surface tension: the creation of interfacial vorticity and thence a Kelvin-Helmholtz instability in two dimensions. This problem is solvable analytically for a building block of 2D turbulence: a lone vortex interacting with an interface. I will then discuss signatures of this new instability when multiple vorticity patches interact with the interfaces in two-dimensional decaying turbulence. Finally, I will discuss flows generated by bubbles rising under gravity and the underlying energy transfer mechanisms. These examples highlight that the small-scale structures in multiphase flows are very different from Newtonian flows.

Friday, Jun 17th 2022

04:00 PM