Tata Institute of Fundamental Research
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Seminar

Nature of plasma turbulence and magnetic reconnection going from fluid to kinetic scales

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Turbulence and magnetic reconnection are ubiquitous phenomena in laboratory, space, and astrophysical plasmas. Turbulence involves transfer of energy from large to small scales via nonlinear interactions, for example in the solar wind, and magnetic reconnection involves conversion of magnetic energy to particle energy via change in magnetic topology, for example in solar flares. Both these phenomena involve a vast range of scales which makes numerical simulations indispensable but challenging. I will present numerical simulations of these phenomena done with fluid magnetohydrodynamic (MHD) and kinetic particle-in-cell (PIC) models aimed at developing a better understanding of the interplay between these two very different regimes. We find that MHD describes turbulence properly at large scales, while microscopic current sheets make an appearance at small scales which are inherently kinetic in nature and control the energy dissipation processes. On the other hand, I will also show that small scale turbulence can drive reconnection in very large current sheets, while both kinetic and fluid physics come together to determine the reconnection rate in large system sizes.

Monday, Dec 17th 2018

4:00 PM (Tea/Coffee at 3:30 PM)

Auditorium, TIFR-H