

Seminar

Institute for Plasma Research

Title : Conservative regularization of ideal fluids and plasmas

Speaker: Ms. Sonakshi Sachdev
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Date : 29th January 2020 (Wednesday)

Time : 03:00 PM

Venue : Seminar Hall, IPR

Abstract :

Ideal systems like Euler and MHD may develop singularities in vorticity and magnetic field. Viscosity and resistivity provide dissipative regularizations. In analogy with the dispersive KdV regularization of the inviscid Burgers equation, we propose a local conservative regularization of vortical singularities in ideal fluids and plasmas (Euler, 2 fluid, quasi-neutral, Hall and ideal MHD). It involves a dynamical cutoff which may be taken as the collisionless skin depth. Our regularization preserves the symmetries of the ideal systems, admits Kelvin-Helmholtz/Alfven-like theorems and leads to an a priori bound on enstrophy. The proposed regularization could facilitate numerical simulations of fluids/plasmas in low dissipation or collisionless regimes. We will discuss a similar conservative regularization of shock-like discontinues in ideal gas dynamics which leads to an elegant 3d generalisation of both the KdV and nonlinear Schrodinger equations.

This work is done in collaboration with my supervisor Govind Krishnaswami, Sachin Phatak (CMI) and A Thyagaraja (Bristol Astrophysics group).
