

Departmental Colloquium

Landau damping and nonlinear echoes

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Abstract: In this talk we will discuss some of the intricacies of Landau damping in the collisionless Vlasov equations or the collisionless limits of Vlasov-Fokker-Planck equations. We will discuss the construction of solutions to the Vlasov-Poisson equations on $S \times \mathbb{R}$ which are arbitrarily close to homogeneous equilibrium in Sobolev regularity but which display arbitrarily long sequences of nonlinear oscillations known as plasma echoes. In particular, these oscillations show that the collisionless linearization is not valid for long times in Sobolev regularity. Further, we show that the inclusion of weak collisional effects suppress these plasma echoes and make it possible to obtain Sobolev regularity results. We also prove that Debye shielding and dispersive effects can suppress such nonlinear oscillations (joint with Nader Masmoudi and Clement Mouhot). Combined with the existing infinite regularity results of Mouhot and Villani, these results together confirm and refute a variety of conjectures made by both mathematicians and physicists over the years regarding Landau damping near homogeneous equilibrium.

Friday, April 14 at 3:00 PM in SEO 636