Recent Developments in Kinetic, Kinetic-Fluid Models

Sihyun Song

Yonsei University

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Abstract: In this talk, we briefly review some recent results in kinetic theory. First, we discuss the Vlasov-Poisson-Fokker-Planck model in two dimensional space subject to an external magnetic field. Global existence of weak solutions is established - then, it is shown that the macroscopic current densities converge to an equilibrium state which satisfies a hyperbolic partial differential equation. Second, we discuss a kinetic-fluid system, the Navier-Stokes-Vlasov system, which describes the interaction of particles within a fluid. The global-in-time existence of solutions – either strong or weak – is established through the help of exponential stability estimates. Furthermore, their large-time-behavior is discussed, by showing that the distribution function converges to the product of an asymptotic profile and the Dirac measure in velocity.

연세대학교 수학계산학부

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