Bernoullis Tafelrunde

Graduate Student Seminar

Thursday, 24 May 2018, 12:15-13:00
Seminarraum 00.003, Spiegelgasse 1

Silvia Ligabue

Universität Basel

On the N-body problem and the Vlasov-Poisson equation

Abstract

The N-body problem describes the motion of N particles which move according to Newton's equations of motion under the influence of an external or self-induced force. The difficulty in the mathematical study of these systems relies in the huge number of particles; however Kinetic Theory is not interested in the detailed analysis of the motion of each particle, but in the collective behaviour of the system. The idea is to use a statistical description of the many particle system given by a distribution function f in the phase space. In this talk, we will focus on the Vlasov-Poisson system, which models, for instance, the evolution of stars in a galaxy or charged particles in a plasma, in the case collisions are rare (therefore negligible) and the only force is induced by the system itself. We will give an overview on some results concerning existence and uniqueness of solutions to the Vlasov-Poisson system (each result assumes different hypotheses on the initial density), explaining one of the main difficulties of this problem, which is the control on large velocities. In our work, which is based on some adaptation of the ODE theory developed by Bohun-Bouchut-Crippa, this difficulty reflects in the necessity of some control on the superlevels of the "Lagrangian flows".