Division for Engineering Sciences,
Physics and Mathemathics

3rd Workshop on Kinetic Theory and Applications
Karlstad University, Sweden, 15 – 17 June 2003

Abstracts

L.Caffarelli (Austin, TX): *Optimal transportation and some classical inequalities*
Abstract: We will discuss how the PDE properties of optimal transportation imply correlation and related inequalitites.

M. Benedicks (Stockholm): *Ergodic properties of Hénon maps and related dynamical systems*
Abstract: In this talk I will discuss the development in dynamical systems that started with the proof by Lennart Carleson and myself of chaotic behaviour for a family of Hénon maps. I in particular I will talk about the more recent development in the ergodic theory of these and related maps: existence of Sinai-Ruelle-Bowen measures, decay of correlation and stability under random perturbations (joint work with Lai-Sang Young and Marcelo Viana). I also plan to discuss some open problems that possibly can be addressed by these and related methods.

V.Kolyada (Madrid): *On Sobolev type inequalities*
Abstract: We study (anisotropic) Sobolev spaces of functions whose weak derivatives belong to L^p . For functions in these spaces, we consider sharp estimates of smoothness in L^q , ~q>p. In particular, we obtain inequalities between gradient norm and various Besov norms. We consider also a mixed Besov norms which have certain relation to averaging type lemmas often used in applications to kinetic equations and PDEs. We apply these results to prove some theorems on integrability of Fourier transforms.

and the pattern is represented by the homogeneous functions, defined by the oscillatory integrals of the Fresnel or Airy type.

G.Toscani (Pavia): *Asymptotic properties of the inelastic Kac model*

S.Calogero (Potsdam): *The Nordstrom-Vlasov system*

Abstract: The Nordstrom-Vlasov system describes the dynamics of a self-gravitating ensemble of collisionless particles in the framework of a relativistic scalar theory of gravitation. Although this is not a physically correct model, it is interesting because it still captures some of the essential features which distinguish the non-relativistic model, the Vlasov-Poisson system, from the correct relativistic model, the Einstein-Vlasov system. Examples of such features are the non-linearity of the field equation and the propagation of gravitational waves due to the hyperbolic character of the system. In this talk I will give a short introduction to the Nordstrom-Vlasov system and present some results concerning the existence of classical solutions and of spherically symmetric equilibria with finite radius.

B.Wennberg (Göteborg): *Deriving the Boltzmann equation from a lattice gas*

Abstract: G. Gallavotti made a rigorous derivation of a linear Boltzmann equation from the Lorentz gas. The Lorentz gas describes the dynamics of a single particle moving in straight lines between circular scatterers on which the particle is specularly re ected. In the paper of Gallavotti, scatters of radius r are distributed according to a Possion process in the plane with density 1/r, and the Boltzmann equation is obtained in the limit when
$r \to 0$. In a purely periodic distribution of scatters, it is not possible to derive a Boltzmann equation, but Caglioti, Pulvirenti and Ricci analysed a random, but periodic distribution, and proved that in that case, the limit is a Boltzmann equation. Motivated by this, we have studied a family of models intermediary between the case studied by Caglioti et al, and the purely periodic distribution. This model was presented at the meeting in Karlstad 2002. At that time, we had proved that a “Markovian modification” of the Lorentz gas does indeed converge as expected. To prove the desired result, we also needed a result stating that the Markovian version is in the limit equivalent to the Lorentz gas. In the talk, I will brie y review the ideas behind the Lorentz gas and the limiting procedure leading to the Boltzmann equation. And I will in discuss the difference between the Lorentz gas and the Markovian version, and show that they are equivalent in the limit. (Joint work with Valeria Ricci).