Division for Engineering Sciences,
Physics and Mathemathics

nd Wo k hop on Kine ic Theo and Applica ion
Ka l ad Uni e i , S eden, 3 Sep embe 00

Ab ac

G.Toscani (Pavia): *Long-time asymptotics of some kinetic models of granular flows*

Ab ac : We analyze the long-time asymptotics of certain one-dimensional kinetic models of granular

Y.Sone (Kyoto): *Bifurcation of and ghost effect on the temperature field in the Bénard problem of a gas in the continuum limit*

Ab ac : A gas in a time-independent state under a uniform weak gravity in a general domain is considered. The asymptotic behavior of the gas in the limit that the Knudsen number of the system tends to zero (or in the continuum limit) is investigated on the basis of the Boltzmann system for the case where the flow velocity vanishes in this limit, and the fluid-dynamic-type equations and their associated boundary condition describing the behavior of the gas in the continuum limit are derived. The equations, different from the Navier-Stokes ones, contains thermal stress and infinitesimal velocity. The system is applied to analysis of the behavior of a gas between two parallel plane walls heated below (Bénard problem), and the bifurcation and thus a strongly distorted temperature field are found in infinitesimal velocity and gravity. This is an example showing that the Navier-Stokes system fails to describe the correct behavior of a gas in the continuum limit.

K.Aoki (Kyoto): *Half-space problem of condensing vapor flows in the presence of a noncondensable gas*

Ab ac : A steady flow of a vapor in a half space condensing onto a plane condensed phase of the vapor at incidence is considered in the case where another gas that neither evaporates nor condenses (the noncondensable gas) is present near the condensed phase. The behavior of the vapor and noncondensable gas is investigated on the basis of kinetic theory under the assumption that the molecules of the noncondensable gas are mechanically identical with those of the vapor. In particular, the relation, among the parameters of the vapor at infinity (the pressure, temperature, and flow velocity of the vapor), those related to the condensed phase (temperature of the condensed phase and the corresponding saturation pressure of the vapor), and the amount of the noncondensable gas, that admits a steady solution is obtained numerically by the use of a model Boltzmann equation proposed by Garzo *et al*. [Phys. Fluids A , 380 (1989)]. The present analysis is the continuation of an earlier work by Sone *et al*. [Transp. Theory Stat. Phys. , 297 (1992)], where the case in which the vapor flow is condensing perpendicularly onto the condensed phase is investigated exclusively.
The present half-space problem plays an important role in connection with the behavior of steady flows of a vapor around arbitrarily shaped bodies, consisting of the condensed phase of the vapor, in the continuum limit (i.e., the limit where the mean free path of the vapor molecules vanishes) in the case where a small amount of a noncondensable gas is contained in the system. This point will be discussed in detail.

L.Söderholm (Stockholm): *Nonlinear evolution of sound wave to Burnett order*

S.Rjasanow (Saarbrücken): *Numerical solution of the Boltzmann equation on the uniform grid*

Ab ac : In the present paper a new numerical method for the Boltzmann equation is developed. The gain part of the collision integral is written in a form which allows its numerical computation on the uniform grid to be carried out efficiently. The amount of numerical work is shown to be of the order O(n log(n)) for the most general model of interaction and of the order O(n) for the Variable Hard Spheres (VHS) interaction model, while the formal accuracy is of the order O(n^{-}). Here n denotes the number of discretisation points in one direction of the velocity space. Some numerical examples for Maxwell pseudo-molecules and for the hard spheres model illustrate the accuracy and the efficiency of the method in comparison with DSMC computations.

G.Russo (Catania):*Spectral method for the time dependent, space non-homogeneous Boltzmann equation*

R.Pettersson (Göteborg):*On stationary and time dependent solutions to the linear Boltzmann equation*

A.Heintz (Göteborg): *On penetration of fractals by rarefied gases.*
Ab ac : The talk concerns mathematical problems connected with penetration of a membrane with fractal holes between two volumes filled a rarefied gas described by linear or by non-linear Boltzmann equation. The possibility of the penetration depends on the regularity of solutions and on the Hausdorff dimension of the channels.

C.Mouhot (Lyon):*Regularity theory for SHBE with cut-off*

B.Wennberg (Göteborg): *On the derivation of the linear Boltzmann equation from the periodic Lorentz gas* (work together with Valeria Ricci, Rome)
Ab ac : It has been proven (by Gallavotti, and by Spohn), that it is possible to rigourously derive the linear Boltzmann equation from the elastic Lorentz gas, if the distribution of scatterers is random. Contrary to this, Bourgain et al showd that the Boltzmann-Grad limit of the Lorentz gas with a periodic distribution of scatteres does not lead to a Boltzmann equation; somehow randomness has to be introduced. Following an original idea by Caglioti et al, we show that the Boltzmann equation can be derived from a periodic distribution of scatters, if a certain fraction of the scatters are removed by a random process.