

Publication List

• Published or submitted

- (1) ALONSO, R., AND LODS, B.: Uniqueness and regularity of steady states of the Boltzmann equation for viscoelastic hard-spheres driven by thermal bath. *Submitted (2011)*.
*Summary:*In this paper a detailed analysis of the well posedness and regularity for the stationary problem for viscoelastic particles is performed. The method of proof is based in the analysis of the so-called elastic limit of the problem (The elastic limit is a physically meaningful regime in which the particles interact almost elastically).
- (2) ALONSO, R., BORCEA, L., AND GARNIER J.: Wave propagation in waveguides with random boundary. *Submitted (2011)*.
*Summary:*We present a detailed analysis of the cumulative effect of the boundary random fluctuations in the long range propagation of waves in waveguides. A comparison with the case of interior inhomogeneities is presented as well.
- (3) ALONSO, R., AND LODS, B.: Two proofs of Haffs law for dissipative gases: The use of entropy and the weakly inelastic regime. *Submitted (2011)*.
Summary: In this paper is a follow up of the work (6). We relax the assumptions on the initial conditions, we assume initial data only with finite initial entropy, to obtain a rigorous proof of the free cooling dynamics in viscoelastic particle systems. Interestingly, we are able to use the classical entropy functional to obtain the main result.
- (4) ALONSO, R., BORCEA, L., PAPANICOLAOU G., AND TSOGKA, C.: Detection and imaging in strongly backscattering randomly layered media. *Inverse Problems.*, **27**, no. 2, 025004 (2011).
Summary: This paper is concerned with the theoretical analysis of a detection algorithm in finely layered random media. Detailed characterization of the singular values of the response matrix is obtained justifying the systematic approach of the algorithm for detecting and refining the time windows that contain the echoes that are useful in imaging.
- (5) ALONSO, R., AND GAMBA, I.: Gain of integrability for the Boltzmann collisional operator. *Kinetic and related models.*, **4**, no. 1, 41–51 (2011).
Summary: This paper is devoted to prove the gain in integrability for the Boltzmann collisional operator using elementary techniques. The proof presented avoids the technical issues of the existent proofs regarding Sobolev embeddings or pseudo-differential operators. This allows us to relax the assumptions on the collisional kernel and thus, simplify the applications to the Boltzmann theory.
- (6) ALONSO, R., AND LODS, B.: Free cooling and high-energy tails of granular gases with variable restitution coefficient. *SIAM J. Math. Anal.* **42**, no. 6, 2499-2538 (2010).
Summary: This work presents the first rigorous proof of the generalized Haffs law yielding the optimal algebraic cooling rate of the temperature of a granular gas described by the homogeneous Boltzmann equation for inelastic interactions with non constant restitution coefficient.
- (7) ALONSO, R., CARNEIRO, E., AND GAMBA, I.: Classical inequalities for the Boltzmann collision operator. *Comm. Math. Physics.* **298**, no. 2, 293-322 (2010).

Summary: Integrability properties of a more general version of the Boltzmann collision operator that includes inelastic interactions are studied. The document presents a Young's inequality for hard potentials, a Hardy-Littlewood-Sobolev inequality for soft potentials, and estimates with exponential weights for hard potentials.

- (8) ALONSO, R., AND GAMBA, I.: Distributional and classical solutions to the Cauchy Boltzmann problem for soft potentials with integrable angular cross section. *JSP.* **137**, no. 5-6, 1147 - 1165 (2010).

Summary: Existence, uniqueness, propagation of regularity and stability of distributional solutions to the Cauchy inhomogeneous Boltzmann problem for soft potentials with integral Grad's cut-off assumption are studied in the near vacuum and local Maxwellian regimes.

- (9) ALONSO, R., CARNEIRO, E.: Estimates for the Boltzmann collision operator via radial symmetry and Fourier transform. *Adv. Math.* **223**, no. 2, 511–528 (2010).

Summary: An extension of the L^p theory for the Boltzmann collision operator is presented using new ideas based in radial symmetry. This approach greatly simplify existent technical proofs and obtain explicit sharp constants.

- (10) ALONSO, R.: Existence of global solutions to the Cauchy problem for the inelastic Boltzmann equation with near-vacuum data. *IUMJ.* **58**, no. 3, 999–1022 (2009).

Summary: The Cauchy problem for the inelastic inhomogeneous Boltzmann equation is studied for small data. Existence and uniqueness of weak solutions is obtained using the classical iteration process of Kaniel & Shinbrot.

- (11) ALONSO, R., SANTILLANA, M., AND DAWSON, C.: Analysis of the diffusive wave approximation of the Shallow Water equations. *EJAM.* **19**, no. 5, 575–606 (2008).

Summary: Proofs of the most relevant results existing in the literature are presented using constructive techniques that lead to the implementation of numerical algorithms to obtain approximate solutions for this equation.

- (12) ALONSO, R., GAMBA, I.M.: Propagation of L^1 and L^∞ Maxwellian weighted bounds for derivatives of solutions to the homogeneous elastic Boltzmann Equation. *JMPA.* **9**, no. 6, 575–595 (2007).

Summary: A generalization of the theory presented by Bobylev, Gamba and Panferov is given. The results are used to prove the propagation of Sobolev Maxwellian-weighted norms for the homogenous Boltzmann Cauchy problem.

• Dissertation, Thesis and Graduation Project

- (1) Dissertation: *The Boltzmann equation: Sharp Povzner Inequalities Applied to Regularity Theory and Kaniel & Shinbrot Techniques Applied to Inelastic Existence.*

Supervisor: Dr. Irene Gamba, (2008).

- (2) Thesis: *Application of Advanced Control Techniques for Theoretical Description of a Tracking System with Optical Scopes.*

Original Title: *Utilización de Técnicas Avanzadas de Control para la Descripción Teórica de un Sistema de Seguimiento por Miras Ópticas.*

Supervisor: Dr. Alain Gauthier, (1998).

- (3) B.S Graduated Project: *Phone Calls Generator (Application for the Compact Norstar System 6/16).*

Original Title: *Generador de Llamadas (Aplicación para el Sistema Norstar Compacto 6/16).*

Co-author: Francisco Useche.

Supervisor: Ing. Francisco Viveros & Ing. Jorge Sanchez, (1996).

- **On preparation**

- ALONSO, R., BORCEA, L., AND SOLNA K.: Wave propagation in time depending random waveguides. *On preparation.*
Summary: This is an important research work in the direction of time varying random media. It mainly focuses in resolving slow moving objects immerse in a weak random media.
- ALONSO, R., GAMBA, I., AND THARKABHUSHANAM, S. H.: Accuracy and Consistency of Lagrangian based Conservative Spectral method for Space-homogeneous Boltzmann Equation. *On preparation.*
Summary: This work quantifies for the first time the numerical error of the spectral deterministic method for solving the Boltzmann equation in both inelastic and elastic gases. The error is a sum of two errors, the first due to velocity truncation domain and the second due to Fourier series truncation.
- ALONSO, R., AND YOUNG J.: Particle model of the cell cytoskeleton. *On preparation.*
Summary: This is a numerical work that describes the cell cytoskeleton using particle kinetic models. This approach is interesting because is able to model rupture of cross links easily and maintain accuracy using a low number of interacting fibers.
- ALONSO, R., CANIZO, J., GAMBA, I., MISCHLER S., AND MOUHOT C.: The homogeneous Boltzmann equation with a cold thermostat. *On preparation.*
Summary: This paper studies the evolution of a dilute elastic gas cool down by heating term modeled as a cold thermostat. The model has interesting properties not found in inelastic flow models, in particular, it produces a sudden partial condensation of the gas.
- ALONSO, R., AND LODS, B.: Granular gases with variable restitution coefficient driven by diffusion processes. *On preparation.*
Summary: This paper considers physical relevant models for granular flows driven by heating terms generated by random processes more general than Brownian motions. These processes have been found to describe more accurately the dynamical evolution of inelastic flows in market and distribution of wealth models.
- ALONSO, R., CANIZO, J., GAMBA, I., AND MOUHOT, C.: About the creation of exponential moments in the Boltzmann equation. *On preparation.*
Summary: This work is about the regularity theory of the Boltzmann equation. Here we prove that solutions of the Boltzmann equation have all statistical moments bounded for $t > 0$ only assuming finite mass and energy in the initial distribution.
- ALONSO, R., AND PANFEROV, V.: Alignment of rods. From the particle description to the kinetic scale. *On preparation.*
Summary: In this paper we want to address the rigorous derivation of the kinetic model that describe rods alignment. We want to investigate basic properties of the kinetic model, for instance, existence of stationary states and free cooling.