Publicacions més rellevants de la línia de recerca:
Equacions cinètiques i de difusió en models de física-matemàtica

Referència: Blanchet, A., Carrillo, J. A., Masmoudi, N. Infinite Time Aggregation for the Critical PKS model in R2. *Comm. Pure and Applied Mathematics*, **61** (2008), pp. 1449–1481.

Abstract: We analyze the two-dimensional parabolic-elliptic Patlak-Keller-Segel model in the whole Euclidean space R2. Under the hypotheses of integrable initial data with finite second moment and entropy, we first show local-in-time existence for any mass of free-energy solutions, namely weak solutions with some free energy estimates. We also prove that the solution exists as long as the entropy is controlled from above. The main result of the paper is to show the global existence of free-energy solutions with initial data as before for the critical mass. Actually, we prove that solutions blow up as a delta Dirac at the center of mass when t diverges when their second moment is kept constant at any time. Furthermore, all moments larger than 2 blowup as t diverges if initially bounded.

Referència: Bisi, M., Carrillo, J.A., Toscani, G. Contractive Metrics for a Boltzmann equation for granular gases: Diffusive equilibria. *J. Stat. Phys.*, **118** (2005), pp. 301-331.

Abstract: We quantify the long-time behavior of a system of (partially) inelastic particles in a stochastic thermostat by means of the contractivity of a suitable metric in the set of probability measures. Existence, uniqueness, boundedness of moments and regularity of a steady state are derived from this basic property. The solutions of the kinetic model are proved to converge exponentially as t diverges to this diffusive equilibrium in this distance metrizing the weak convergence of measures. Then, we prove a uniform bound in time on Sobolev norms of the solution, provided the initial datum has a finite norm in the corresponding Sobolev space. These results are then combined, using interpolation inequalities, to obtain exponential convergence to the diffusive equilibrium in the strong L1-norm, as well as various Sobolev norms.

Referència: Carrillo, J.A., McCann, R.J., Villani, C. Contractions in the 2-Wasserstein length space and thermalization of granular media. *Archive for Rational Mechanics and Analysis*, **179**

(2006), pp. 217–263.

Abstract: An algebraic decay rate is derived which bounds the time required for velocities to equilibrate in a spatially homogeneous flow-through model representing the continuum limit of a gas of particles interacting through slightly inelastic collisions. This rate is obtained by reformulating the dynamical problem as the gradient flow of a convex energy on an infinite-dimensional manifold. An abstract theory is developed for gradient flows in length spaces, which shows how degenerate convexity (or even non-convexity), if uniformly controlled, will quantify contractivity (limit expansivity) of the flow.