MAP ∞ PDMA

Seminar 2021/2022

Modeling and applications in kinetic theory of mixtures

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November 12, 2021, 16h30, via zoom
https://videoconf-colibri.zoom.us/j/86389857315

In many problems arising in the interface of mathematics with engineering, natural and life sciences, one important aspect is the presence of different scaling regimes of evolution [1]. For example, when modeling biological systems, one should describe not only the global behaviour of the cellular populations but also the cellular dynamics and the biological expression of cells [2]. In fluid dynamics, many problems are described by a macroscopic approach, like Euler or Navier-Stokes, but a microscopic model is needed to describe transition regimes like gas-surface interactions [3]. The kinetic theory is a branch of statistical mechanics that provides a detailed description of the gas at small scales. It allows to obtain the corresponding macroscopic analogue as the hydrodynamic limit of the kinetic equations [4]. Thus, it offers a very convenient approach to many different problems.

In this seminar, I will present some interesting problems and applications of the kinetic theory to both fluid dynamical processes and and biological systems.

References

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[3] B. Anwasia, P. Gonçalves, A.J. Soares, From the simple reacting sphere kinetic model to the reaction-diffusion system of Maxwell-Stefan type, *Commun. Math. Sci.*, 17(2), 507–538, 2019.

[4] C. Villani, *A review of mathematical topics in collisional kinetic theory*, in S. Friedlander and D. Serre Eds, Handbook of Mathematical Fluid Dynamics, vol. 1, pp. 71–305, North-Holland, Elsevier, 2002.

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