From Boltzmann to Incompressible Navier-Stokes : Hydrodynamical Limits and Speed of Convergence.

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Abstract

If one looks at the microscopic movements of particles in a gas or a fluid, they are ruled by Newton's laws. However, several different equations can be used to model the general behaviors : Euler, Navier-Stokes, Boltzmann among others.
This talk will begin with a discussion about the mathematical coherence that exists between the latter modellings. Then I will focus on the rigorous derivation of the Incompressible Navier-Stokes fluid equation from the Boltzmann equation for gases. Along the way I will present a convergence result based on a hypocoercive property of the linear Boltzmann operator and I will conclude by presenting how one can obtain convergence rates between the two models thanks to Fourier transform and the spectrum of the linear operator.

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