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From microscopic to macroscopic: the hydrodynamic limit

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Considerable success has been obtained in deriving macroscopic equations (e.g. Euler fluid equations or Fourier equation) starting from a microscopic stochastic dynamics. Given the fact that chaotic dynamics can be naively thought as stochastic, it is natural to investigate the possibility to emulate the stochastic results in the deterministic setting, hence attempting to derive macroscopic equations from deterministic (Hamiltonian) dynamics. I will first describe what one would like to accomplish pointing out the many formidable obstacles. To deal with the latter it is necessary to start considering some special, simpler, cases. I will discuss some possibilities. Then I will describe some more technical dynamical systems results that, hopefully, go in the right direction.

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