Fluctuating Hydrodynamics for Dilute Active Gases

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Hydrodynamics equation are often used to describe active systems in a coarse-grained way. For a lot of applications, the particle number is not big enough to totally discard finite number of particles effect. That is why physicists have been adding noise terms in hydrodynamics equations to take into account graininess. As a statistical physicist, I am interested in how to derive this noise term from the microscopic dynamics. In this talk, I will show how to derive a fluctuating kinetic theory, and the corresponding fluctuating hydrodynamics, for a dilute gas of aligning self-propelled particles. The result is a set of stochastic partial differential equations for the density field and orientation field that describe the collective motion of active particles at the macroscopic level. The noise term is derived from the microscopic dynamics.

References

1. O. Feliachi, M. Besse, C. Nardini, J. Barré, *Journal of Statistical Mechanics: Theory and Experiment*, **2022**, 113207, (2022).