

Continuum descriptions for dynamics of self-propelled particles

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Dynamics of particles with self-propulsion, in the simplest case expressed by the condition of constant speed, has received a lot of attention in recent years due to applications in emergent self-organized behavior such as flocking and swarming. In situations when the number of particles becomes large a continuum description becomes possible, in which a system may be described by a coarse-grained density and direction fields. The lack of the momentum conservation in such systems presents specific difficulties in applying known approaches from kinetic theory. I will discuss results of analysis and numerics concerning the problem of validation of hydrodynamic equations for systems of self-propelled particles with various types of interactions.