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Correlations in microswimmer suspensions VIKTOR SKULTETY, ALEXANDER MOROZOV, University of Edinburgh, UK — Recent years witnessed a significant interest in physical, biological and engineering properties of self-propelled particles, such as bacteria or synthetic microswimmers. The main distinction of this 'active matter' from its passive counterpart is the ability to extract energy from the environment and convert it into directed motion. One of the most striking consequences of this distinction is the appearance of collective motion in self-propelled particles suspended in a fluid observed in recent experiments and simulations: at low densities particles move around in an uncorrelated fashion, while at higher densities they organise into jets and vortices comprising many individual swimmers. Here, we present a novel kinetic theory that predicts the existence of strong correlations even below the transition to collective motion. We calculate the velocity-velocity correlation functions and the effective diffusivity of passive tracers, and reveal their non-trivial density dependence. The theory is in quantitative agreement with our recent Lattice-Boltzmann simulations (J. Stenhammar et al., Phys. Rev. Lett. 119, 028005 (2017)) and captures the asymmetry between pusher and puller swimmers below the transition to collective motion.

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