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Fluctuations and Pattern Formation in collective dynamics of bacteria APARNA BASKARAN, SHRADHA MISHRA, M. CRISTINA MARCHETTI, Syracuse University — We consider a coarse-grained description of a bacterial system modeled as rod like self-propelled particles. The dynamics is given by hydrodynamic equations for a density and an orientation field that corresponds to the velocity of the bacteria. We find that the ordered swarming state of the system is unstable to spatial fluctuations beyond a threshold set by the self-propulsion velocity of individual units. In this unstable regime, the system goes into an inhomogeneous state that is characterized by well-defined robust propagating stripes of swarming particles interspersed with low density disordered regions. Further, we find that even in the regime where the homogeneous swarming state is stable, the system is characterized by large fluctuations in both density and orientational order. We study the hydrodynamic equations analytically and numerically to characterize these two phases of the swarming state.

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