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Collective dynamics of active suspensions in confined geometries DENIS BARTOLO, ESPCI-Paris Diderot University, ERIC LAUGA, UCSD, JEAN-BAPTISTE CAUSSIN, ENS Lyon — We discuss the collective dynamics of suspensions of self-propelled particles confined in confined geometries. First, we revisit the conventional description of the hydrodynamic couplings between swimmers living in thin films or in shallow channels. We show that these hydrodynamic interactions are chiefly set by the particle size and shape irrespective of the microscopic propulsion mechanism. Second, we use kinetic theory to study the phase behavior of dilute suspensions. Finally, we exploit these results to show that the hydrodynamic interactions destabilize isotropic suspensions of polar particles, thereby yielding spontaneous collective motion at large scales. In contrast, suspensions of apolar particles only display weakly cooperative motion at small scales. We also investigate the case of aligned suspensions. Their behavior is very similar to the bulk phase of dipolar swimmer. They display generic instabilities at all scales. Comparisons of our theoretical findings with experiments on artificial swimmers will be shown.

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