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Effect of hydrodynamic interactions in confined active suspensions BARATH EZHILAN, DAVID SAINTILLAN, Department of Mechanical and Aerospace Engineering, University of California San Diego — The dynamics of biologically active suspensions in confined geometries is investigated by incorporating accurate boundary conditions within the kinetic theory framework [Saintillan and Shelley, Phys. Fluids. (2008)]. Even in the absence of wall hydrodynamic interactions or imposed flow, swimming microorganisms have a tendency to accumulate at confining boundaries due to self-propulsion. Satisfying a zero wall-normal translational flux condition on the active particle probability distribution function captures this effect. Using a moment-closure approximation, analytical expressions for the equilibrium concentration/polarization profiles are derived in the dilute limit. As particle density increases, we expect particle-particle hydrodynamic interactions to become significant and to destabilize these equilibrium distributions. Using a linear stability analysis and 3D finite volume simulation of the equations for the orientational moments, we study in detail the effect of fluid coupling on the stability properties of the equilibrium states in confined active suspensions.

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