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Spatially inhomogeneous bacterial clusters in weak shear flow

The bacteriaemial cluster dynamics has many novel properties, which widely differ from the traditional soft condensed matter systems and arise from a rich spectrum of non-equilibrium behavior: flocking, chemotaxis and bioconvection. In this talk we will detail how to derive a hydrodynamic model for swarming clusters with particles of an arbitrary shape, moving in a 3-dimensional space inside a viscous solvent and in a sufficiently dilute suspension limit. The model is then restricted to particles with ellipsoidal geometry to quantify the interplay of the long-range excluded volume and the short-range self-propulsion effects. The expression for the constitutive stresses, relating the kinetic theory with the momentum transport equations, are derived using a combination of the virtual work principle (for extra elastic stresses) and symmetry arguments (for active stresses). We then provide preliminary results of these cluster flows, moving in a weak shear.