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Effect of rotational diffusion on the collective behavior of swimming microorganisms in viscoelastic fluids YASER BOZORGI, PATRICK UNDERHILL, Rensselaer Polytechnic Institute — Hydrodynamic interactions of swimming microorganisms can lead to coordinated behaviors of large groups. The impact of viscoelasticity on the collective behavior of active particles driven by hydrodynamic interactions has been quantified with the inclusion of rotational diffusion. Oldroyd-B, Maxwell, and generalized linear viscoelastic modeled are considered as the constitutive equation of the suspending fluid, inspired by some biological fluids. A mean field assumption is used to model the suspension dynamics near an isotropic state. The onset of instability has been quantified by a linear stability analysis in terms of wavenumber, diffusivities, and constitutive equation parameters. Some key results are in contrast to suspensions in Newtonian fluids. The maximal growth rate can occur at a particular wavelength, and diffusion can act to make the system more unstable. Viscoelasticity can also affect the long time dynamics of the continuum equations.

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