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Simulation and continuum modelling of a non-uniform suspension of spherical squirmers TIMOTHY PEDLEY, University of Cambridge, TAKUJI ISHIKAWA, Tohoku University, Sendai, Japan — Stokesian dynamics simulations are performed for a non-dilute suspension of identical spherical squirmers (cells) whose initial concentration distribution $c(x,t)$ is sinusoidal in x. It is found that the c-distribution overshoots its mean, so that there are times at which the maximum values of c occur at locations where initially c was a minimum and vice versa. This is not consistent with a purely diffusive model. We consider continuum models in terms of the cell conservation equation, incorporating the average cell swimming velocity $\boldsymbol{U}$ and representing random cell motion (resulting solely from hydrodynamic interaction between cells) by a diffusivity tensor $\mathbf{D}$. If the values of $\boldsymbol{U}$ and $\mathbf{D}$ obtained from the simulation are used in the equations, the results agree well with the simulations. However, if we start from the Fokker-Planck equation for the pdf of orientation, representing hydrodynamic interactions by a constant rotational diffusivity, and truncating the sequence of moment equations at the first or second moment, agreement is not very good. We discuss what would be needed in a continuum model for it to be able to predict $\boldsymbol{U}$ and $\mathbf{D}$ accurately, without doing the full simulation first.

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