Abstract Submitted
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An anisotropic-fluid model for inhomogeneous Stokesian suspensions JOE GODDARD, University of Caliornia, San Diego — A constitutive model is proposed for a suspension of rigid spheres with spatially non-uniform strain rate **E** and particle concentration ϕ. As in [1], the model involves a 4^{th} rank viscosity tensor depending on ϕ and a 2^{nd} rank structure tensor **A** determined by a kinematic evolution equations. The particle flux **j** is a linear function of the spatial gradients in ϕ, **E**, & **A** . In contrast to existing models [2,3], the constitutive equations exhibits Stokesian linearity in **E**, and all nonlinear suspension-dynamics effects are represented by **A** and its evolution. An expansion up to third order in **A** is given, and illustrative calculations are made for oscillatory simple shear based on parameters determined as in [1]. Desirably, the model offers a frame-indifferent description of the effects of streamline curvature on particle flux; and it admits transiently negative particle diffusivities following shear reversal, indicating dominance of Stokesian reversibility over shear-induced memory loss. The main drawback, is the plethora of scalar parameters, and possible simplifications inspired by previous models are discussed briefly.
[1] J. D. Goddard, *J. Fluid. Mech.*, 568:1–17, 2006.
[2] G. P. Krishnan, et al., *J. Fluid Mech.*, 321:371–93, 1996.
[3] R. J. Phillips, et al., *Phys. Fluids A*, 4(1): 30–40, 1992.

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