Dispersed multiphase flows: From Stokes suspensions to turbulence

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Dispersed two-phase flows of particles or small bubbles in liquids arise commonly in the chemical industry or for materials handling, with typical volume fractions in the range of 1-30%. Indeed there is considerable knowledge of the dynamics of such flows in the range of low particle Reynolds numbers that is relevant to processes in the ocean. The flow is determined by the usual viscous stresses and by the cumulative effect of the local stresses generated by the randomly dispersed particle phase, including the effects of particle-particle contacts. We describe the results of numerical simulations of the flows both for Stokes suspensions, where the fluctuations are dominated by the distribution of particle phase and for a turbulent flow, where local fluid inertia and particle inertia play important roles. The issues of how to characterize the particle interactions, stresses and the particle fluxes will be discussed.

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