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**The Average Stress in Fluid-Particle Flows** ANDREA PROSPERETTI[1], QUAN ZHANG, Johns Hopkins University — We present an analysis of the average stress in a disperse fluid-particle flow. It is shown that, in addition to the well-known stresslet contribution to the symmetric mixture stress, other contributions arise whenever the disperse-phase volume fraction or the particle-fluid relative velocity is non-uniform. Furthermore, even in the absence of external couples acting on the particles, in general the stress also acquires a non-symmetric contribution. The analysis is general and applicable in any Reynolds number regime. As an example, the general expressions are evaluated for the case of particles in Stokes flow. The dilute limit is treated by extending to the non-uniform case Batchelor's renormalization procedure, while computational ensemble averaging is used for dense systems. Estimates of the importance of the new terms are presented.

[1]Also faculty of University of Twente, The Netherlands

Andrea Prosperetti
Johns Hopkins University

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