

Abstract Submitted  
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**Nearest Particle Statistics and Particle-fluid-particle Stress of Multiphase Flows**<sup>1</sup> DUAN ZHANG, Los Alamos National Laboratory — This presentation starts with showing an important relation between the ensemble average and the average based on the nearest particle. Using this relation one can study long-range particle-fluid-particle (PFP) interactions by defining an effective short-range correlation accounting for effects of other surrounding particles. Physical meanings of this correlation will be presented, and the mathematical derivations will be outlined. This nearest particle average is compared with the average conditional on a pair of particles. For short-range forces, the ensemble averages calculated from the both methods are the same. For long-range forces the nearest particle average has an advantage. Using the effective short-range correlation force for hydrodynamic interactions among particles, a PFP stress is defined. The physical meanings of this stress will be examined. Using dilute potential and Stokes flows as examples, the PFP stresses are calculated. For cases of finite particle volume fractions, a numerical method is proposed to calculate this stress using the results of particle forces. This study of nearest particle statistics leads to many interesting and unanswered questions of particle interactions in disperse multiphase flows.

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