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Analytic expressions for first order correction to inviscid unsteady forces due to surrounding particles in a multiphase flow[1] SUBRAMANIAN ANNAMALAI, S. BALACHANDAR, YASH MEHTA, University of Florida — The various inviscid and viscous forces experienced by an isolated spherical particle situated in a compressible fluid have been widely studied in literature and are well established. Further, these force expressions are used even in the context of particulate (multiphase) flows with appropriate empirical correction factors that depend on local particle volume fraction. Such approach can capture the mean effect of the neighboring particles, but fails to capture the effect of the precise arrangement of the neighborhood of particles. To capture this inherent dependence of force on local particle arrangement a more accurate evaluation of the drag forces proves necessary. Towards this end, we consider an acoustic wave of a given frequency to impinge on a sphere. Scattering due to this particle (reference) is computed and termed "scattering coefficients." The effect of the reference particle on another particle in its vicinity, is analytically computed via the above mentioned "scattering coefficients" and as a function of distance between particles. In this study, we consider only the first-order scattering effect. Moreover, this theory is extended to compressible spheres and used to compute the pressure in the interior of the sphere and to shock interaction over an array of spheres.

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