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Incorporating Volumetric Displacement Effects In Euler-Lagrange Simulations of Particle-Laden Oscillatory Flows[1] SOURABH APTE, Oregon State University, JUSTIN FINN, University of Liverpool, ANDREW CIHONSKI, Los Alamos National Laboratory — Recent Euler-Lagrange discrete element modeling of a few microbubbles entrained in a traveling vortex ring (Cihonski et al., JFM, 2013) has shown that extension of the point-particle method to include local volume displacement effects is critical for capturing vortex distortion effects due to microbubbles, even in a very dilute suspension. We extend this approach to investigate particle-laden oscillatory boundary layers representative of coastal sediment environments. A wall bounded, doubly periodic domain is considered laden with a layer of sediment particles in laminar as well as turbulent oscillatory boundary layers corresponding to the experiments of Keiller and Sleath (1987) and Jensen et al. (1987). Inter-particle and particle-wall collisions are modeled using a soft-sphere model which uses a nested collision grid to minimize computational effort. The effects of fluid mass displaced by the particles on the flow statistics are quantified by comparing a standard two-way coupling approach (without volume displacement effects) with volume displacement effects to show that the latter models are important for low cases with low particle-fluid density ratios.

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