Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Particle pair settling through a thin density interface DAVID DEEPWELL, Univ of Alberta, RAPHAEL OUILLON, Massachusetts Institute of Technology, ECKART MEIBURG, University of California, Santa Barbara, BRUCE SUTHERLAND, University of Alberta — A particle will settle through an interface if it is dense enough. Due to the viscosity of the fluid, a particle settling through an interface will drag lighter, upper layer fluid with it into the lower layer, thereby deforming the interface. Neighbouring particles interact with this descent leading to further particle entrainment. As this process continues, the collection of particles form a larger plume that enhances the particle settling rate. Experiments indicate that this is the cause for an enhanced settling rate compared to that of an individual particle. To understand the origins of this collective settling problem, we analyzed the simpler behaviour of a pair of particles passing through a thin interface of a miscible Newtonian fluid. This provides a framework to understand the larger collective settling of multiple particles. Direct numerical simulations were used to measure the particle paths for a wide range of particle separation distances, orientation angles, and the strength of the stratification. The volume of fluid entrainment due to a particle pair relative to that of an individual particle was found to be enhanced for vertically aligned particles and weak stratification.

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Date submitted: 24 Jul 2020 Electronic form version 1.4