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Settling of small heavy particles in flows with wide scale separation JAVIER DAVILA, University of Seville — Many theoretical and numerical studies found in literature describe how the settling of small heavy particles is enhanced by most vortex flows, being this enhancement optimal for Stokes and flow Froude numbers of the order unity. In this work we study the dynamics of particles in a vortex cellular flow with two length scales: the radius of the vortices R and the distance between them L. Considering an artificial life time of the vortices we have found that when $L/R \sim 10^2$ the results are qualitatively similar to those found in DNS. However when $L/R > 10^3$ the scaling of the maximum average settling velocity changes. This result can be explained in terms of the time and velocity scales appearing in the problem (Davila & Hunt, JFM 2001). Apart from the inertial particle response time and the fluid residence time in this case it is important to consider the particle residence times associated with both scales, the life time of the vortices, and the time that small heavy particles need to escape from the vortices. The average settling velocity can be more than 80% larger than the terminal velocity. As a result of this strong difference in settling velocities between particles the collision efficiency may reach very high values.

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