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Numerical Investigation of the Preferential Concentration Instability of Particle Laden Homogeneous Shear MOHAMED KASBAOUI, Sibley School for Mechanical and Aerospace Engineering, Cornell University, DONALD KOCH, School of Chemical and Biomolecular Engineering, Cornell University, OLIVIER DESJARDINS, Sibley School for Mechanical and Aerospace Engineering, Cornell University — In a previous study (Kasbaoui et al, J. Fluid Mech. 2015), particle laden homogeneous shear was shown to be subject to an algebraic instability. Initially randomly distributed particles are entrained by wave-like perturbations in the fluid velocity and segregate in a similar wave-like pattern while they sediment under gravity. The preferential concentration mechanism, which is the tendency of particles to exit vortical regions and gather in straining regions, causes the two waves to amplify each other resulting in an algebraic instability. By means of simulations, we compare the perturbations growth to the one yielded by the theory in the limit of small Stokes number particles. The simulations are conducted with an Eulerian model of the particles as well as a Lagrangian model. The two are compared. A secondary Rayleigh-Taylor instability caused by the periodic stacking of heavy layers of concentrated particles on top of depleted lighter layers is analyzed.

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