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**An instability of a homogeneous sheared gas-solid suspension driven by preferential concentration** DONALD KOCH, GANESH SUBRAMANIAN, Cornell University, IAN EAMES, University College London — We have performed a linear stability analysis for an unbounded, initially homogeneous dilute particle-gas suspension subject to a simple shear flow for particle Stokes numbers that are small but non-zero. It is well known that the inertia of aerosol particles causes them to be thrown out of vortices and to accumulate in regions of high strain rate. This leads a decrease in the particle concentration in regions where the perturbation velocity reinforces the vorticity of the imposed shear flow and an increase in particle concentration in regions where the perturbation velocity tends to cancel the vorticity of the imposed flow. The gravitational force acting on this inhomogeneous density field reinforces the perturbation velocity leading to a growth of the perturbation. The shearing motion turns the wave vector of the disturbance flow eventually arresting the growth. However, if the shear is weak compared with the gravitational settling, the perturbation grows exponentially larger than its initial value before this arrest occurs. We suggest that secondary instabilities may continue the growth of particle concentration fluctuations.

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