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The effect of particle inertia on buoyancy-driven instabilities in particle-laden flows[1] SARA NASAB, PASCALE GARAUD, University of California, Santa Cruz — Modeling particles in a fluid has been approached by a number of methods. One of the simpler models used treats both particles and fluid as a continuum, a single-fluid model. Particle motion is derived under the assumption that particle drag and gravity are in equilibrium, neglecting particle inertia. Applicable to dilute systems consisting of small particles, the single-fluid model is not valid in many practical settings, where particles and fluid are more weakly coupled. Here we consider a two-fluid model in which particle inertia is included, by solving for fluid motion and particle motion, separately. Coupling between the two fluids is due to drag. We investigate the buoyancy-driven instabilities that this two-fluid model has, focusing on behavior that deviates from the single-fluid model. Our results are obtained using linear stability analysis. Direct Numerical Simulations are used to study the nonlinear saturation of the instabilities.

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