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Rayleigh-Taylor and Rayleigh-Benard like instabilities in two-size two-densities granular flow UMBERTO D'ORTONA, M2P2, CNRS, Aix-Marseille Univ., Centrale Marseille, NATHALIE THOMAS, CNRS, Aix-Marseille Univ — Rayleigh-Taylor and Rayleigh-Benard instabilities are among the most classical hydrodynamical instabilities. In both cases, the buoyancy is responsible for the instability. When put into motion, dry granular materials behave as liquids. The granular segregation induces a migration of large particules to the surface, while dense particles move to the bottom. Dense and large particles migrate to the top or the bottom depending on size and density ratios. Here, large and dense particles are chosen such that they migrate to the surface. We show experimentally and numerically that a layer of dense particles put above a layer of less dense particles develops a Rayleigh-Taylor instability while flowing. If dense particles are also larger and subject to upward segregation, the two-layer system destabilizes as well. Furthermore, if the system is initially made of one homogeneous layer, the segregation first induces the formation of a dense layer at the surface which destabilises later. This self-driven Rayleigh-Taylor instability occurs for various density and size ratios. While time evolves, a pattern of parallel stripes forms with convection cells analogous to Rayleigh-Benard cells. The motor of the instability is the granular segregation.

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