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Modeling density segregation in granular flow HONGYI XIAO, RICHARD LUEPTOW, PAUL UMBANHOWAR, Northwestern University — A recently developed continuum-based model accurately predicts segregation in flows of granular mixtures varying in particle size by considering the interplay of advection, diffusion and segregation. In this research, we extend the domain of the model to include density driven segregation. Discrete Element Method (DEM) simulations of density bidisperse flows of mono-sized particles in a quasi-2D bounded heap were performed to determine the dependence of the density driven segregation velocity on local shear rate, particle concentration, and a segregation length which scales with the particle size and the logarithm of the density ratio. With these inputs, the model yields theoretical predictions of density segregation patterns that quantitatively match the DEM simulations over a range of density ratios (1.11-3.33) and flow rates (19.2-113.6 cm^3/s). Matching experiments with various combinations of glass, steel and ceramic particles were also performed which reproduced the segregation patterns obtained in both the simulations and the theory.

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