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Modeling segregation of bidisperse granular materials: A parametric study[1] CONOR SCHLICK, YI FAN, PAUL UMBANHOWAR, JULIO OTTINO, RICHARD LUEPTOW, Northwestern University — Predicting segregation and mixing of size bidisperse granular material is a challenging problem with many industrial applications. Using an accurate segregation model based on kinematic properties of the flow that we recently developed, we present a parametric study of segregation of bidisperse granular material in quasi-two-dimensional bounded heaps. The model depends on the Péclet number, Pe, which is the ratio of the advection rate to the diffusion rate, and Λ, which is the ratio of the segregation rate to the advection rate. Both dimensionless parameters depend on the feed rate, the particle size ratio, and the system size. Systematic variation of Λ and Pe demonstrates how the spatial particle configuration depends on the interplay of advection, segregation, and diffusion. At large values of Pe and Λ, segregation dominates and the heap consists of distinct regions of small (upstream) and large (downstream) particles, whereas at low values of Pe and Λ, diffusion dominates which results in a well-mixed heap. Advection plays an important role for large Pe and small Λ and preserves the initial configuration of particles in the feed zone.

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