Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

**Segregation Modeling in Modulated Granular Heap Flow**[1]
ZHEKAI DENG, Northwestern University, HONGYI XIAO, University of Pennsylvania, JULIO M. OTTINO, RICHARD M. LUEPTOW, PAUL B. UMBANHOWAR, Northwestern University — Although granular segregation has been investigated extensively for steady flows under various operating conditions and geometries, segregation in unsteady granular flows has not been explored in detail. We focus here on stratification in unsteady size-bidisperse bounded heap flow. Previous experiments have shown that periodically alternating between high and low feed rates of particles falling onto the heap results in regular stratified layers of large and small particles. We model this stratification in a bounded heap using an advection-diffusion equation with an added segregation term. Simply repeatedly switching the model from a low volume flow rate to a high volume flow rate instantaneously along the entire length of the flowing layer results in stratification patterns similar to those observed in experiments. A flow kinematics model that describes the downstream-moving front of particles after a change in the flow rate provides higher fidelity and displays some of the underlying physics how the stratified pattern forms.

[1]This material is based upon work supported by the National Science Foundation under grant no. CBET-1511450.

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Date submitted: 05 Aug 2020 Electronic form version 1.4