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Simulating fluidization of black soldier larvae HUNGTANG KO, Georgia Inst of Tech, OLGA SHISHKOV, University of Colorado, Boulder, DAVID HU, DANIEL I GOLDMAN, Georgia Inst of Tech — Active systems can be driven via the internal activity of individual elements or via external mechanical forcing. Here we study a living system in which both internal and external activity can be varied. In laboratory experiments, we confine thousands of 10 mm long black soldier fly larvae in an air fluidized bed (4 larva lengths in diameter, 10 in height) and study the collective and individual dynamics. When larvae are cooled such that internal activity is suppressed, the system, behaves like a typical fluidized bed: as airflow rate Q increases from zero, the height of the column remains fixed until the pressure drop through this living porous medium balances the weight per area of the larvae. At this point, the height of the column increases with increasing Q while the pressure remains fixed. Active larvae display qualitatively different dynamics such that bed height remains approximately fixed for low Q and begins to increase well before the pressure-balance fluidization transition. Defluidization dynamics (decreasing Q) are similar in both active and inactive larvae. We gain insight into these phenomena in coupled computational fluid dynamics and agent-based simulations.

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