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Compression and release dynamics of an active matter system of *Euglena gracilis* AMY LAM, ALAN C H TSANG, NICHOLAS OUELLETTE, INGMAR RIEDEL-KRUSE, Stanford Univ — Active matter, defined as ensembles of self-propelled particles, encompasses a large variety of systems at all scales, from nanoparticles to bird flocks. Though various models and simulations have been created to describe the dynamics of these systems, experimental verification has been difficult to obtain. This is frequently due to the complex interaction rules which govern the particle behavior, in turn making systematic varying of parameters impossible. Here, we propose a model for predicting the system evolution of compression and release of an active system based on experiments and simulations. In particular, we consider ensembles of the unicellular, photo-responsive algae, *Euglena gracilis*, under light stimulation. By varying the spatiotemporal light patterns, we are able to finely adjust cell densities and achieve arbitrary non-homogeneous distributions, including compression into high-density aggregates of varying geometries. We observe the formation of depletion zones after the release of the confining stimulus and investigate the effects of the density distribution and particle rotational noise on the depletion. These results provide implications for defining state parameters which determine system evolution.

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