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Gradient sensing on a lattice: frustrated droplets and ways to drive them[1] ANTON MOLINA, Stanford University, STEFAN KARPITSCHKA, Max Planck Institute for Dynamics and Self-Organization, MANU PRAKASH, Stanford University — Soft matter systems exhibiting lifelike properties such as motility and gradient sensing challenge us to develop new ways to engineer their emergent, collective behavior. Two-component Marangoni-contracted droplets display a dynamic behavior resembling chemotaxis and a capacity to self-organize due to long-ranged vapor mediated interactions. Here, we present results describing droplet ensembles constrained to organize on a honeycomb lattice. We observe experimentally and confirm by simulation that this is a frustrated system with properties that scale with system size. An external, rotating gravitational field is used to drive the system. High driving amplitudes yield field driven dynamics while low amplitudes produce static configurations characterized by the formation of local vertex states. This transition is characterized by dynamic, non-local structures. We discuss both experimental and simulation results and explore the role of disorder in droplet size. The macroscopic nature of this system gives access to microstate configurations enabling mechanistic connections between global driving and the dynamics of a finite-sized, frustrated system.

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