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Extensional Rheology of Fire Ant Aggregates[1] SCOTT FRANKLIN, MATTHEW KERN, Rochester Institute of Technology, SULISAY PHONEKEO, DAVID HU, Georgia Tech — We explore the extensional rheology and self-healing of fire ant (Solenopsis invicta) aggregations, mechanically entangled ensembles used to form rafts, bivouacs or bridges. Macroscopic experiments create quasi-two dimensional piles and measure the force required to impose a constant end-velocity. This force fluctuates, reminiscent of similar experiments on geometrically cohesive granular materials. Heterogeneous chains develop, with isolated ants often the sole link between top and bottom. Finally, the maximum pile strength scales sub-linearly with the number of ants, with the maximum force per ant decreasing as the pile grows. We reproduce these behaviors with a simple model that represents ants feet as discs connected by a spring (the "leg"). Discs move randomly, and stick to one another when in contact. Discs in contact un-stick at random with a probability that decreases as the spring (leg) is stretched, modeling an ant's tendency to hold on longer when stretched. Simulations qualitatively reproduces the fluctuating force, chain formation and sublinear scaling of maximum force with particle number and give insight into underlying mechanisms that govern the ants' behaviors.

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