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Glass transition originating from a rigidity transition in confluent biological tissues

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Cells must move through tissues in many important biological processes, including embryonic development, cancer metastasis, and wound healing. Often these tissues are dense and a cell's motion is strongly constrained by its neighbors, leading to glassy dynamics. Although there is a density-driven glass transition in self-propelled particle (SPP) models for active matter, these cannot explain liquid-to-solid transitions in confluent tissues, where there are no gaps between cells and the packing fraction remains fixed and equal to unity. We have recently described a different type of rigidity transition that occurs in confluent tissue monolayers in the limit of vanishing cell motility, where the onset of rigidity is governed by changes to single-cell properties such as cell-cell adhesion and cortical tension. Here we alter the model to include cell motility using an equation for polarization similar to those in SPP models. We identify a glass transition line that originates at the critical point of in the rigidity transition, and compare the results to an analytic trap model. The model provides a novel signature for mechanical behavior in confluent tissues, which has been successfully tested in experimental systems. I will also demonstrate that this model provides a framework for studying the Epithelial-to-Mesenchymal transition in cancer invasion and cell sorting during embryonic development.