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Cell Shapes and Traction Forces Determine Stress in Motile Confluent Tissue XINGBO YANG, Northwestern University, DAPENG BI, Rockefeller University, MICHAEL CZAJKOWSKI, LISA MANNING, CRISTINA MARCHETTI, Syracuse University — Collective cell migration is a highly regulated process involved in wound healing, cancer metastasis and morphogenesis. The understanding of the regulatory mechanism requires the study of mechanical interactions among cells that coordinate their active motion. To this end, we develop a method that determines cellular forces and tissue stresses from experimentally accessible cell shapes and traction forces. This approach allows us for the first time to calculate membrane tensions and hydrostatic pressures at a cellular level in collective migrating cell layers out of equilibrium. It helps us understand the mechanical origin of tissue stresses as previous inferred using Traction Force Microscopy (TFM). We test this approach on a new model of motile confluent tissue, which we term Self-propelled Voronoi Model (SPV) that incorporates cell elasticity, contractility and motility. With the model, we explore the mechanical properties of confluent motile tissue as a function of cell activities and cell shapes in various geometries.

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