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Propagating stress waves in spreading and confined cell monolayers[1] KAZAGE J CHRISTOPHE UTUJE, Syracuse University, SHILADITYA BANERJEE, The University of Chicago, M. CRISTINA MARCHETTI, Syracuse University — Many developmental processes such as morphogenesis and wound repair, involve collective cell migration, which in turn requires long-range transmission of mechanical stresses. We consider a minimal physical model of an expanding cell monolayer described as a self-propelled elastic medium coupled to the kinetics of active contractile units. These contractile units represent actomyosin stress fibers that generate local contractile stresses through ATP hydrolysis. The model also considers the effects of time-dependent propulsion forces, arising from fluctuations in the cell polarization. Our model quantitatively reproduces many experimental findings, including propagating stress waves that are driven by a mechano-chemical feedback between mechanical strain and cell contractility. Furthermore, our model predicts that the effective material rigidity of the cell layer undergoes sustained periods of stiffening and fluidization as waves propagate in the system. Using the model, we further investigate the mechanisms of wave propagation in confined geometries, as observed in recent experiments on cell monolayers in micropatterned environments.

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