

A Cell-Level Biomechanical Model of *Drosophila* Dorsal Closure

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Supporting Material:

The support material consists of 4 supplemental figures and 6 movies showing the dynamic evolution of the amnioserosa tissue as predicted by our model. Following are captions to each of the figures and movies.

Figure S1: Bifurcation analysis on the behavior of a single cell. The red line demarcates the steady (below) and oscillatory (above) regimes, and the insets show three typical traces of the cell area. The conditions used in the paper (Fig. 2) is marked by the cyan +.

Figure S2: Time evolution of the signal s (thin line) and myosin M (thick line) for cell 3 marked in Fig. 1 of the paper.

Figure S3: Effect of weakening the internal ratcheting on tissue area oscillation. $\delta L_0 = 0.01L_0$ and $K = 0.1 \text{ nN}/\mu\text{m}$ are fixed. The left panel compares the area contraction of the AS tissue for the different δl_0 values, and the right panels show details of the oscillation for weaker internal ratchets.

Figure S4: Evolution of the cellular myosin M (in unit of μM) in cells labeled 1, 2 and 3 in the paper.

Movie SM1: Oscillation of the amnioserosa in the early phase of dorsal closure, starting from time = -50 min to time = 0. There is no net area contraction of the tissue or of individual cells.

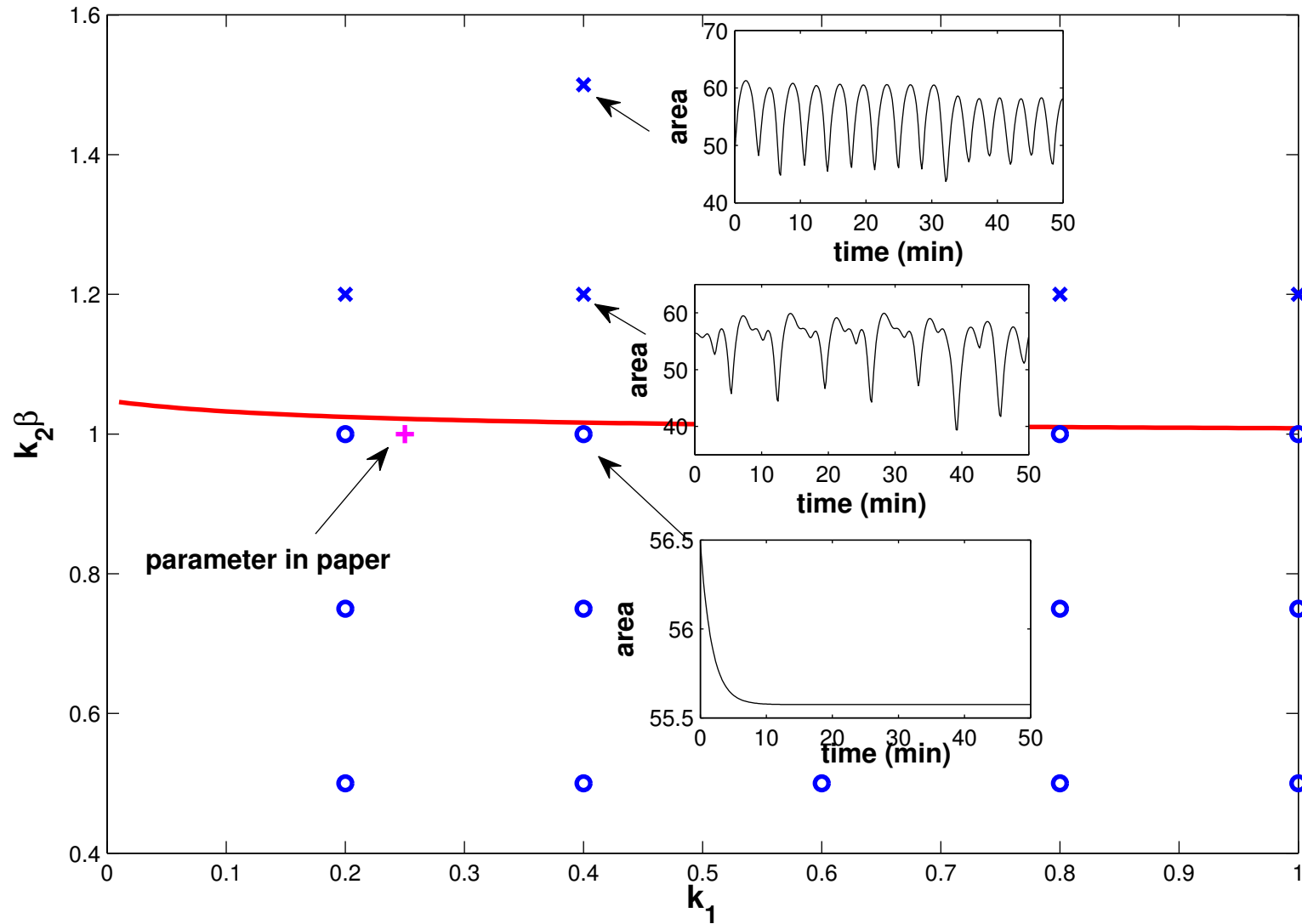
Movie SM2: Contraction (dark) and expansion (light) of cellular area during the oscillation of the early phase, starting from uniform initial signal and myosin distributions. Transient strings of cells contracting or expanding in synchronization appear and disappear in time.

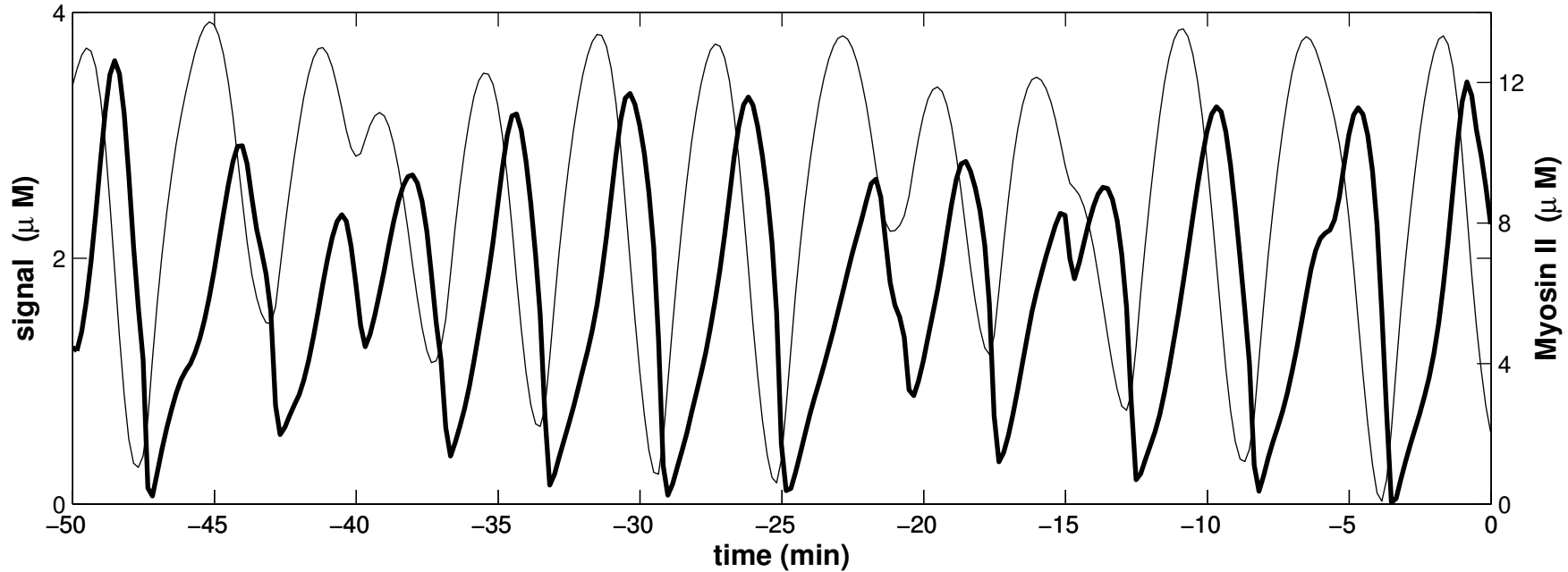
Movie SM3: Contraction of the amnioserosa after the onset of the internal ratchet at time = 0. Note the arrest of cell pulsation starting from the left and right tips and propagating toward the middle.

Movie SM4: The amnioserosa continues to oscillate with little net area contraction and no arrest of cell pulsation when subject to ratcheting action of the actin cable surrounding the tissue. The edge of the tissue becomes smooth.

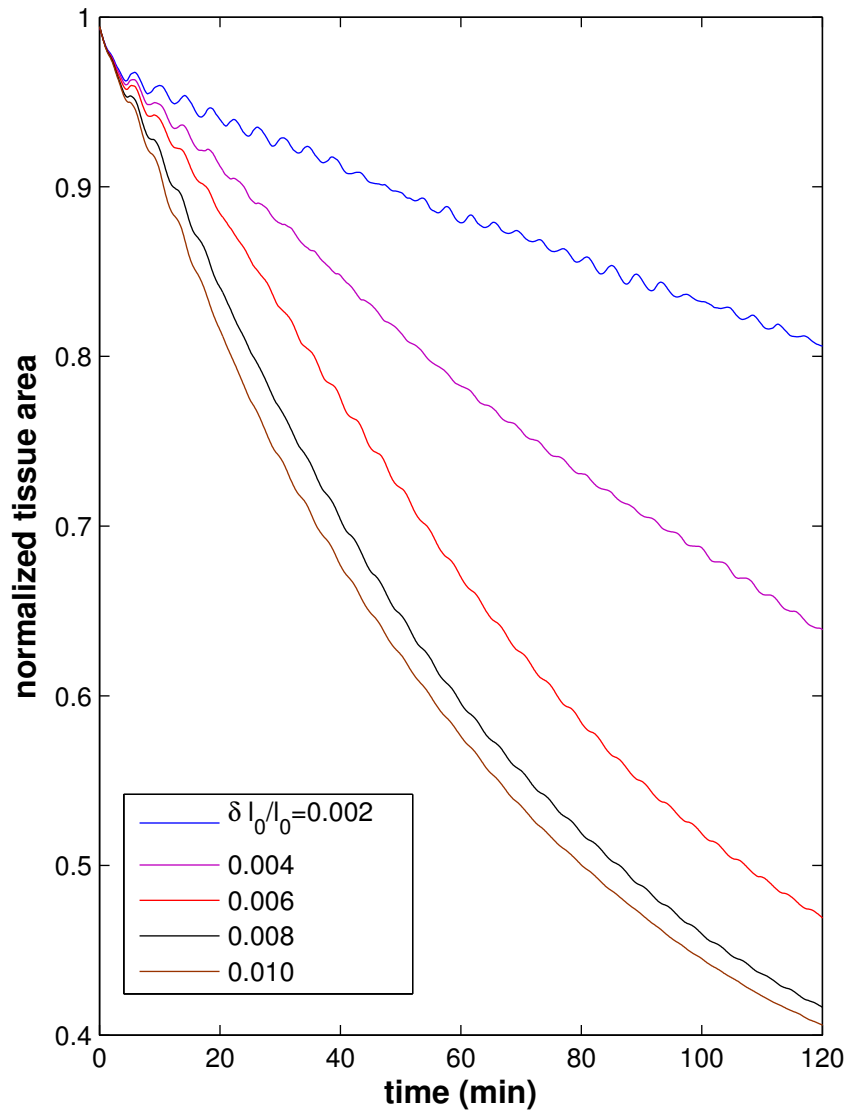
Movie SM5: Contraction of the amnioserosa subject to both the internal ratchet and the actin-cable ratchet during the slow phase of dorsal closure, which starts at time=0 and lasts till time ≈ 80 min.

Movie SM6: Simulation of the entire dorsal closure, including the early phase (-50 min to 0 min), the slow phase (0 to 80 min) and the fast phase (80 min to over 200 min).





$\delta L_0/L_0=0.01, K=0.1$



$\delta I_0/I_0=0.002$

