Supplementary Information

## Dynamic peripheral traction forces balance stable neurite tension in regenerating *Aplysia* bag cell neurons

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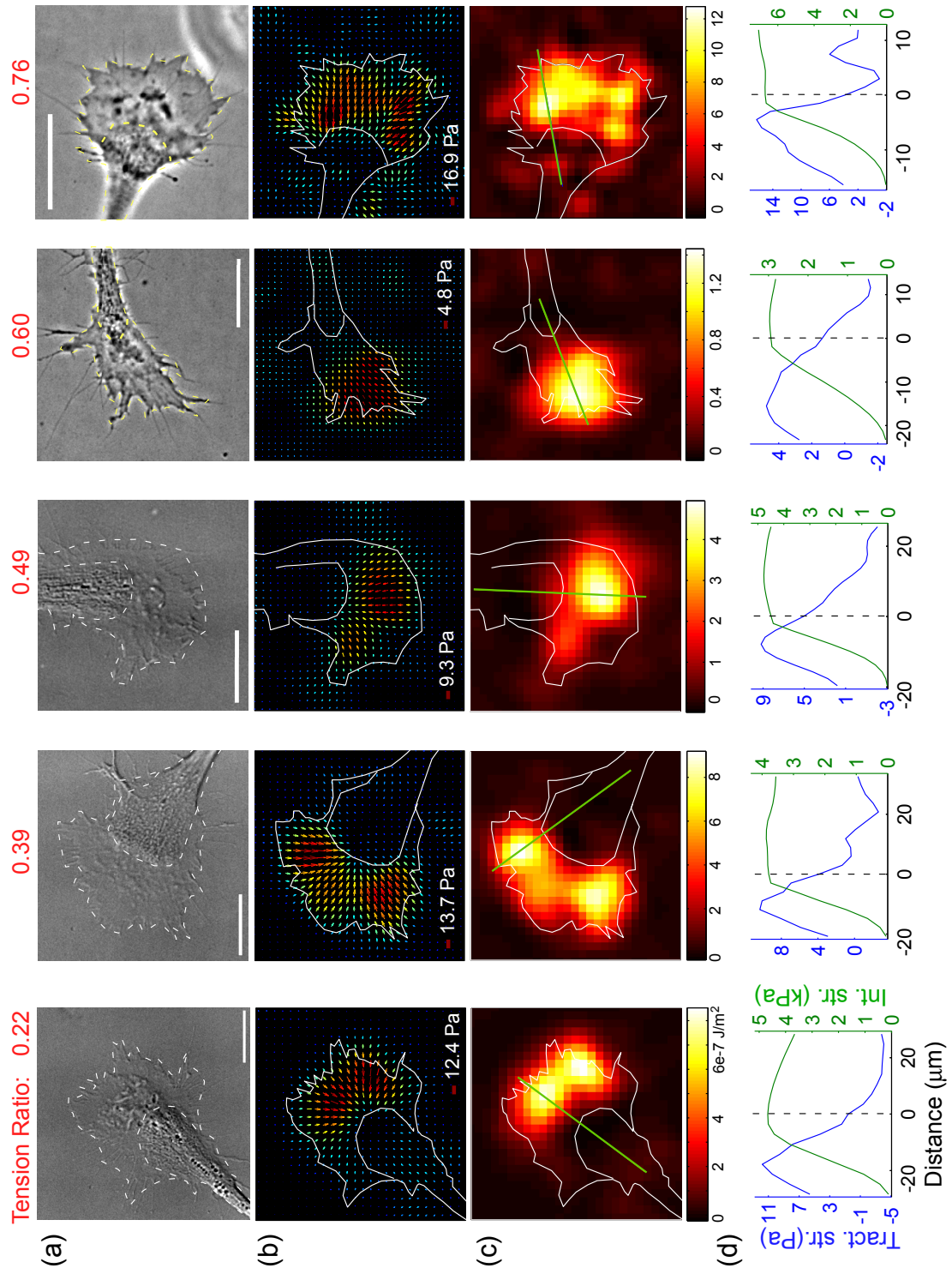
Supplementary Figure 1: Example stress and strain energy maps. (a) Representative phase contrast and DIC images of Aplysia bag cell growth cones. Scale bars are $20\mu m$. (b) Maps of traction stress in the growth cones shown in (a) with outline showing edge of growth cone and neurite and the transition between peripheral domain and central domain. (c) Maps of strain energy density for growth cone in (a). Green line shows location of linescan. (d) Linescans of traction stress (blue) and internal stress (green) for growth cones above. Traces are shifted are shifted such that the position of the transition zone is at zero.
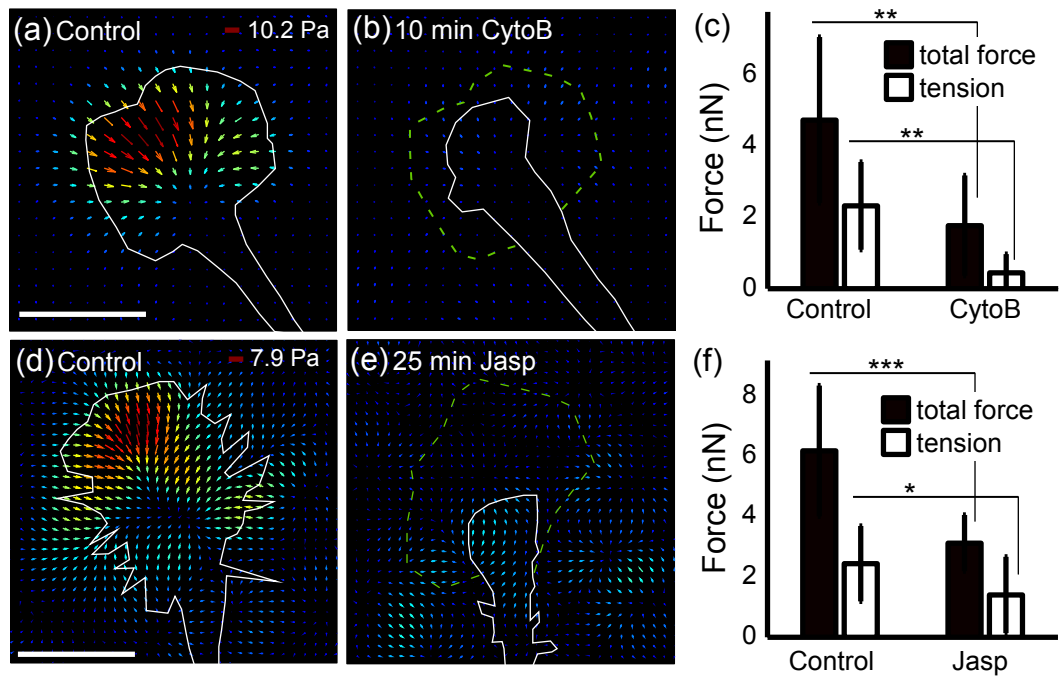
Supplementary Figure 2: Actin disruption inhibits traction force. Stress maps before (a) and after (b) 10 min treatment with 5 μM cytochalasin B (CytoB). (c) Cytochalasin B treatment reduces both total scalar force (control = 4.5 +/- 2.3; cytoB = 1.8 +/- 1.4 nN) and neurite tension (control = 2.3 +/- 1.2; cytoB = 0.4 +/- 0.5 nN, N = 9). Stress maps before (d) and after (e) 25-30 min treatment with 1 μM jasplakinolide (jasp). (f) Japlakinolide treatment reduces both total scalar force (control = 6.1 +/- 2.3; jasp = 3.0 +/- 0.8 nN) and neurite tension (control = 2.3 +/- 1.1; jasp = 1.3 +/- 1.1 nN, N = 20). Scale bars are 20 μm. Error bars are one standard deviation. * = P <0.05, ** = P <0.01, *** = P <0.001.
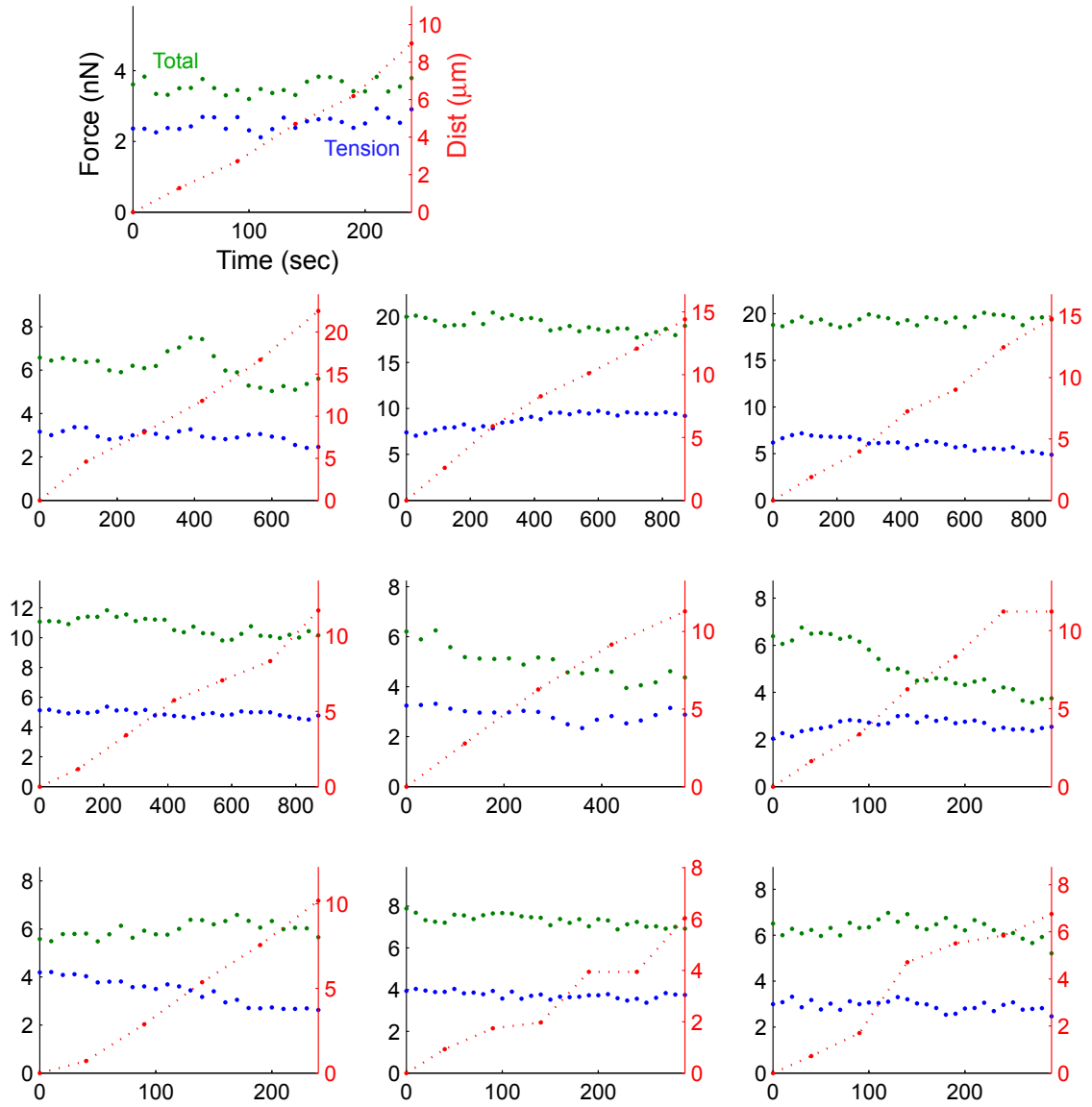
Supplementary Figure 3: Growth cone traction force is consistent during outgrowth
Growth cone position (red line, right axis), tension (blue line, left axis), and total force (green line, left axis) over time for ten additional growth cones.
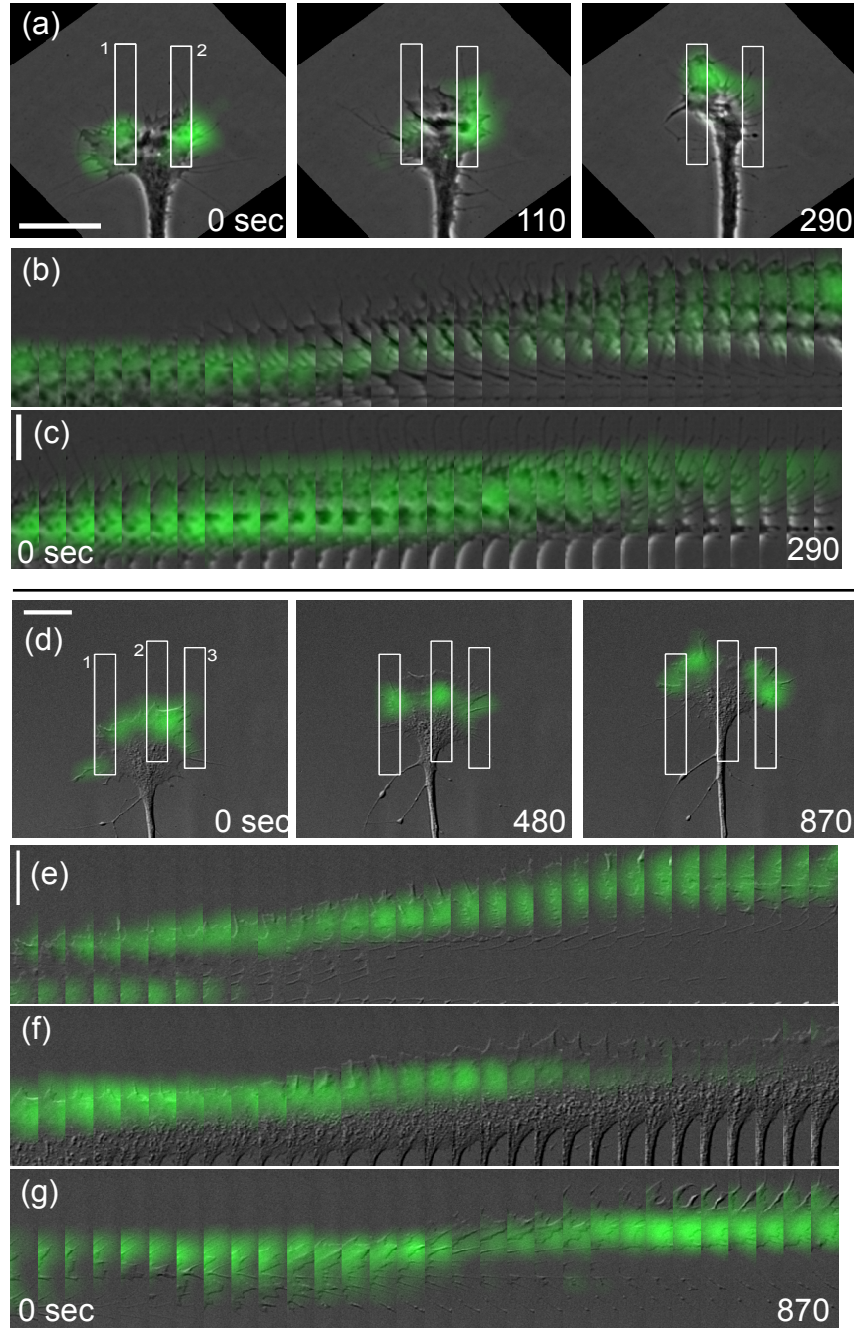
Supplementary Figure 4: Examples of traction redistribution (a) Overlay of DIC and strain energy density (green) at three timepoints. Solid lines outline the central domain at 0 (yellow), 110 (orange), and 290 s (red). Scale bar is 20 μm. (b) Montage of growth sequence corresponding to region 1 in (a), with 10 s interval. (c) Montage corresponding to region 2, 10 s interval. Scale bar is 10 μm. (d) Overlay of DIC and strain energy density (green) at three timepoints. Solid lines outline the central domain at 0 (yellow), 480 (orange), and 870 s (red). Scale bar is 20 μm. (e) Montage of growth sequence corresponding to region 1 in (a), with 30 s interval. Scale bar is 10 μm. (f) Montage corresponding to region 2, 30 s interval. (g) Montage corresponding to region 3, 30 s interval.

Supplementary Video 1: DIC image of advancing growth cone overlain with strain energy density in green. Large green arrow indicates direction and magnitude of neurite tension and is positioned at the center of the growth cone. Total time is 290 seconds, time compression is 70x. Scale bar is $20\,\mu$m.

Supplementary Video 2: DIC image of advancing growth cone overlain with strain energy density in green. Large green arrow indicates direction and magnitude of neurite tension and is positioned at the center of the growth cone. Total time is 780 seconds, time compression is 210x. Scale bar is $20\,\mu$m.

Supplementary Video 3: DIC image of advancing growth cone overlain with strain energy density in green. Large green arrow indicates direction and magnitude of neurite tension and is positioned at the center of the growth cone. Total time is 870 seconds, time compression is 210x. Scale bar is $20\,\mu$m.

Supplementary Video 3: DIC image of advancing growth cone overlain with strain energy density in green. Large green arrow indicates direction and magnitude of neurite tension and is positioned at the center of the growth cone. Total time is 630 seconds, time compression is 210x. Scale bar is $20\,\mu$m.