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**Supplemental information**

**A mechanism for sarcomere breathing: volume change and advective flow within the myofilament lattice**

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## 2 **Supplementary Information for**

### 3 **A mechanism for sarcomere breathing: volume change and advective flow within the** 4 **myofilament lattice**

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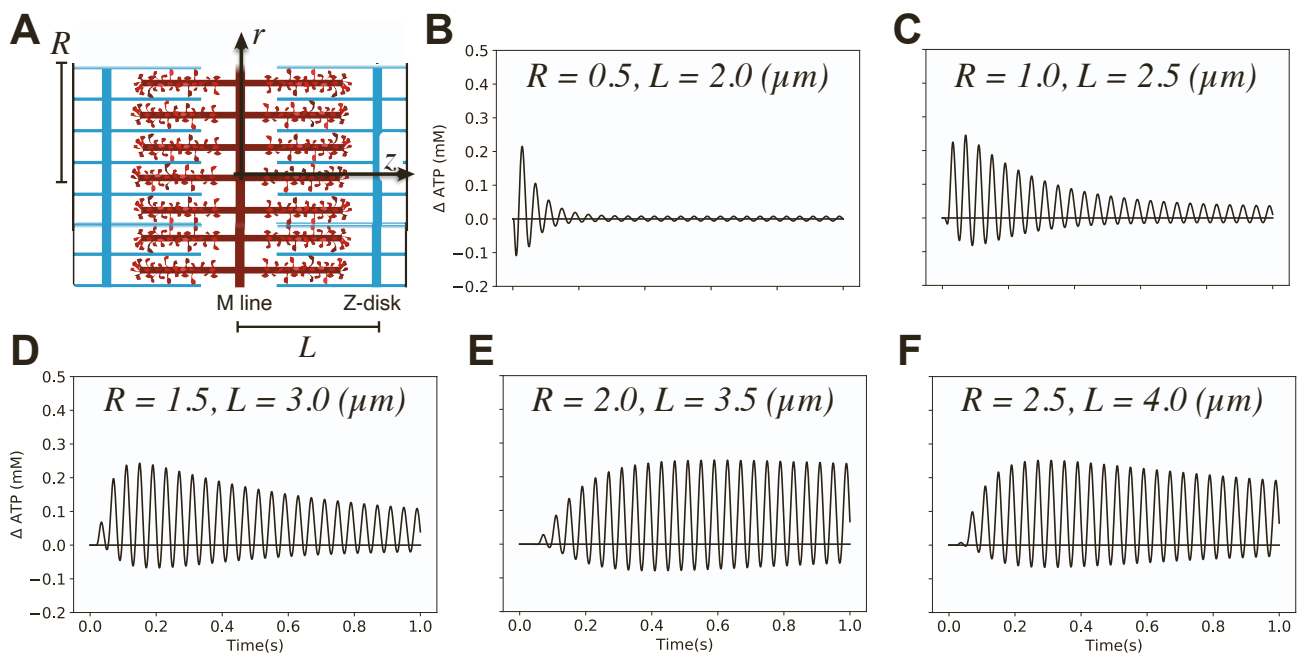
#### 8 **This PDF file includes:**

9 Fig. S1

10 Captions for Movies S1 to S3

#### 11 **Other supplementary materials for this manuscript include the following:**

12 Movies S1 to S3



**Fig. S1. Supplemental Figure 1: Advective advantage as a function of sarcomere size.** (A) Sarcomere size was defined by the radius,  $R$ , and the half-sarcomere length,  $L$ , as in the main document. (B-E) Timeseries of change in ATP during periodic contractions for five different sarcomere sizes. Values were taken at the M-line ( $z/L = 0$ ) and 60% of the radius ( $r/R = 0.6$ ) as in Fig. 2.

13 **Movie S1. Time dependent sarcomere flow field.** A cross-sectional slice of the vector flow field in the sarcomere  
14 interior is shown in normalized radial ( $r/R$ ) and axial ( $z/Z$ ) coordinates. Vector lengths are scaled such that  
15 the amplitude of the flow field at the z-disk is  $3.75 \mu\text{m s}^{-1}$ . Note the presence of a radial jet at the midline  
16 (M-zone) of the sarcomere. Interestingly, this is the region of the thick filament that is not decorated with  
17 cross-bridges.

18 **Movie S2. Time-dependent flow field through the model sarcomere surface.** The sarcomere is modeled as a  
19 cylinder, shown in light red in normalized coordinates. Here, we show the time-dependent flow field along the  
20 radial periphery of the sarcomere. Our field of view rotates, so that we can visualize this field from various  
21 spatial perspectives. Vector lengths are scaled such that the amplitude of the flow field at the z-disk is  $3.75$   
22  $\mu\text{m s}^{-1}$ .

23 **Movie S3. Advection-diffusion model results.** Top panel: This video shows the time-dependent concentration  
24 results from the diffusion-advection (orange) and diffusion-only (blue) models. The concentration is shown  
25 on the y-axis, radial position is along the x-axis, and the video frames display the change over time. The  
26 diffusion-advection model oscillates around the diffusion-only line, as advection pumps ATP into and out  
27 of the model sarcomere periodically. Bottom panel: This section of the video displays a bar chart of the  
28 cycle-averaged advective advantage for each cycle as each cycle completes in the top panel. The advective  
29 advantage here is summed across radial position to make each bar. After each successive cycle completes, the  
30 cycle-averaged advective advantage for the that cycle appears as a new bar.