

Supplementary material 2: Cellular dynamics

Three scenarios of cellular Ca^{2+} homeostasis and contractile response, for parameters $\Phi_A=1, 2$ and a transition from $1 \rightarrow 2$. As stated in the manuscript, parameter Φ_A , corresponding to a net Ca^{2+} influx into the cytosol, has a profound effect on the frequency of oscillatory response.

Results provided are for a single cell (i.e. no intercellular coupling).

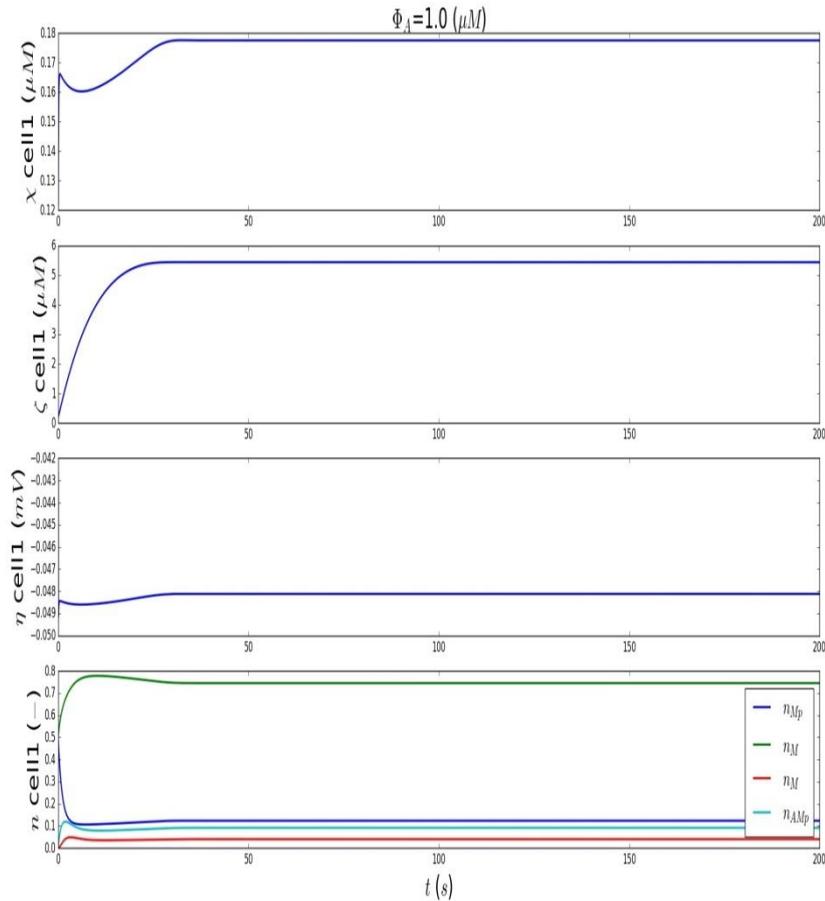


Figure S1. Time evolution of cytosolic Ca^{2+} concentrations (χ), Ca^{2+} in the sarcoplasmic reticulum (ζ), and membrane potential (η) for $\Phi_A=1$ (upper three panels). Lower panel presents the four components of the contractile unit response. The concentrations reach a steady-state plateau within 30 seconds. Note that no oscillations occur as the Ca^{2+} influx is insufficient to trigger the CICR mechanism.

Parameters employed: $dt=10^{-2}\text{s}$, $A_S=0$, $B_1=400$, $E_{\text{Ca}}=12$, $E_k=43$. Other parameters as in Tables 1 and 2. $\alpha_c=\alpha_v=0$, i.e. no intercellular coupling.

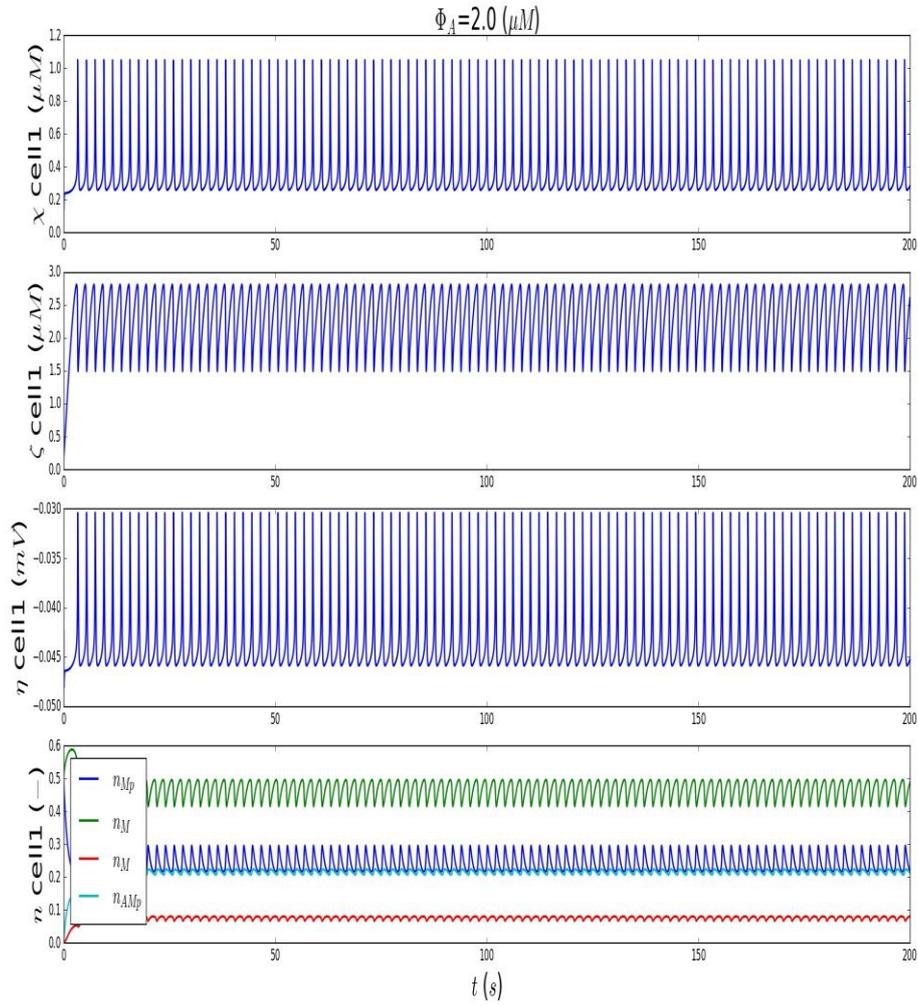


Figure S2. Time evolution of cytosolic Ca^{2+} concentrations (χ), Ca^{2+} in the sarcoplasmic reticulum (ζ), and membrane potential (η) for $\Phi_A=2$ (upper three panels). Lower panel presents the four components of the contractile unit response. All traces are in an oscillatory range, as Ca^{2+} influx is adequate to initiate and sustain the Ca^{2+} -induced Ca^{2+} release from intracellular stores. Note that transition phase is very short at $<10s$. Parameters are the same as in the previous simulation.

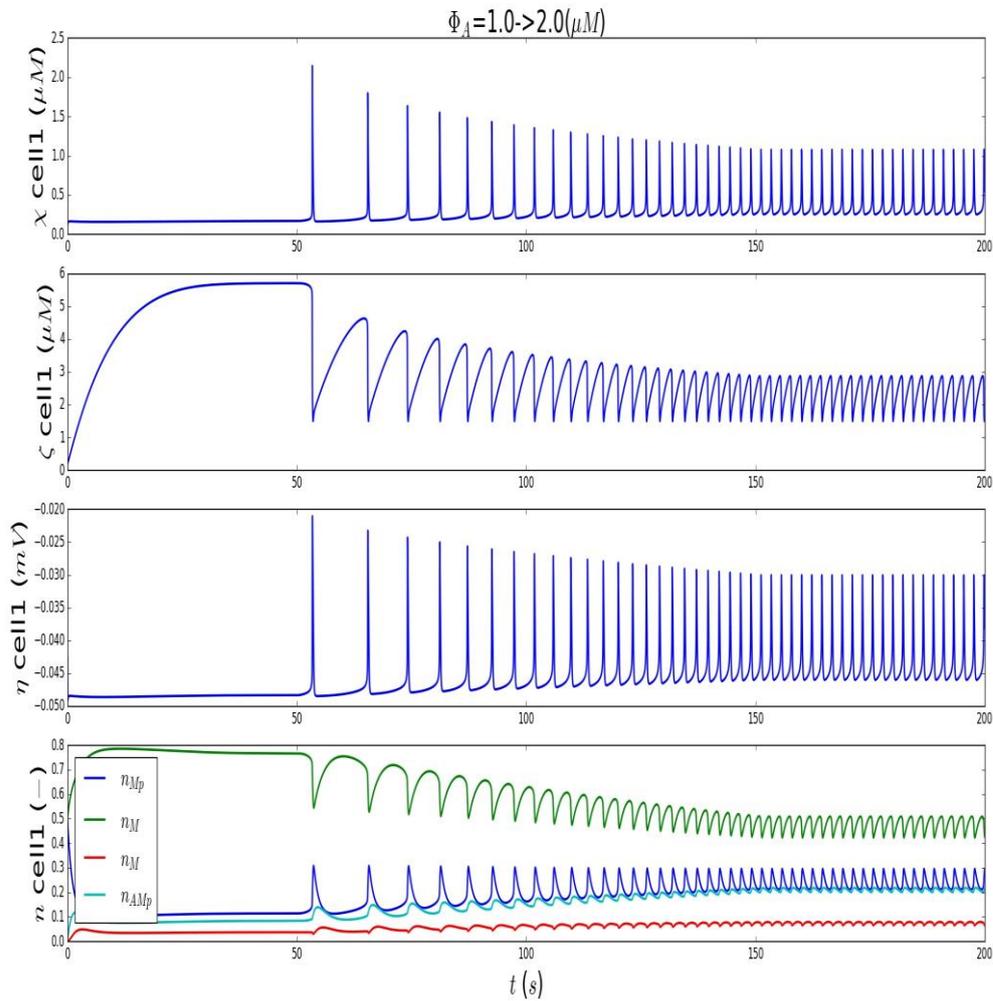


Figure S3. Time series of variables described in the previous two Figures. Simulations correspond to a transition of variable Φ_A from $1 \rightarrow 2$, illustrating the initiation of oscillatory activity. The transition phase lasted from from 50 to 100 s. Simulation parameters same as in Figures S1, S2.

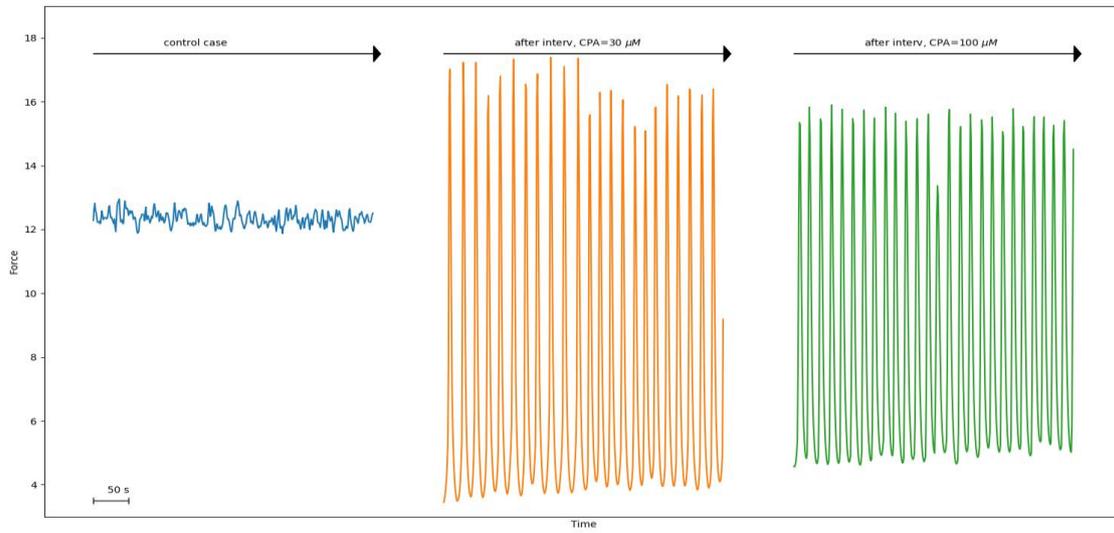


Figure S4. Experimental time-series: Force evolution during CPA interventions. The three segments correspond to Control (pre-intervention), 30 μM and 100 μM CPA concentrations.

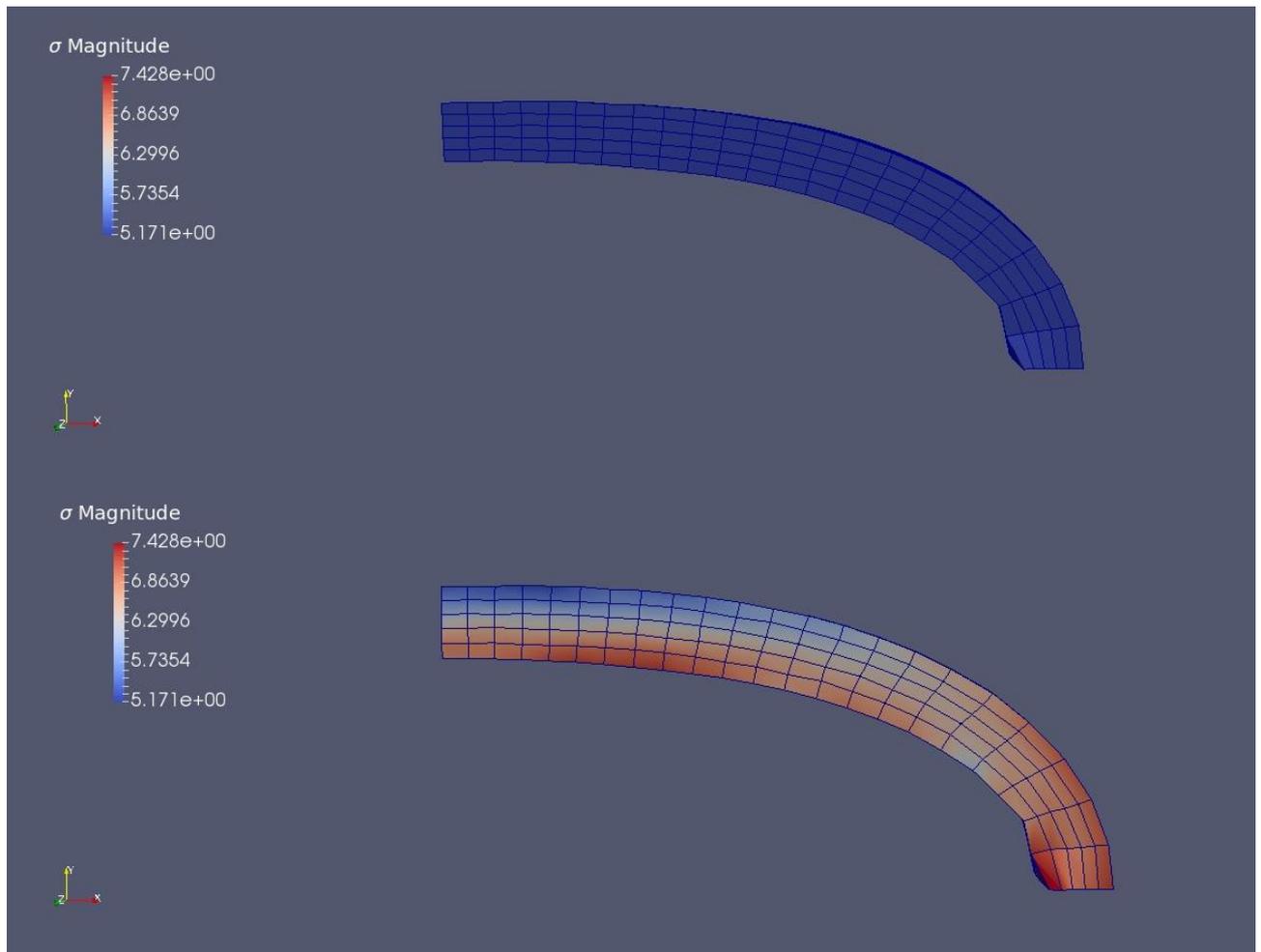


Figure S5. Stress distribution along the arterial ring before and after simulated phenylephrine intervention. The quantity plotted has been post-processed by the software ParaView (A. Henderson, ParaView Guide, A Parallel Visualization Application. Kitware Inc., 2007), option “Magnitude”.

