Ca^{2+} subsystem

$$\tau_a \frac{da}{dt} = a_\infty(w \cdot s \cdot a - \theta, c) - a + \hat{\xi}(a)$$

$$\tau_s \frac{ds}{dt} = s_\infty(a) - s$$

$$\tau_\theta(a) \frac{d\theta}{dt} = \theta_\infty(a) - \theta$$

$$\frac{dc}{dt} = [v_1 f_\infty(c) + v_2][c_{er} - c] - \frac{v_3 c^2}{\kappa_3^2 + c^2} + \jmath_0 + \jmath_1 a - \frac{v_4 c^4}{\kappa_4^4 + c^4}$$

$$\frac{dc_{tot}}{dt} = \jmath_0 + \jmath_1 a - \frac{v_4 c^4}{\kappa_4^4 + c^4}$$

where $c_{er} = (c_{tot} - c)/\lambda$ and

$$f_\infty(c) = \frac{1}{1 + e^{(\theta_m - c)/k_m}} \cdot \frac{1}{1 + e^{(\theta_h - c)/k_h}}$$

Ca^{2+} Subsystem
• arrows represent Ca^{2+} movement

Legend ★

IP_3R receptors
$+ v_1 f_\infty(c)$

Ca^{2+} leak from ER
$+ v_2$

serca pumps into ER
$- v_3$

constant Ca^{2+} influx
$+ \jmath_0$

Ca^{2+} uptake during activity
$+ \jmath_2(a)$

Ca^{2+} efflux from cell
$- v_4$

★ signs respective to cytosol.

cell body
ER
IP₃R
Ca^{2+} uptake (constant)
Ca^{2+} uptake during activity
leak
Serca pumps
Ca^{2+} efflux