

Three Dimensional Spatio-Temporal Calcium Dynamics in a Cardiac Cell

Shawn A. Means

James Sneyd, supervisor

Calcium ions are essential second messengers in a vast array of biological cellular control mechanisms, inducing, for instance, contraction of muscle and cardiac cells. The intracellular dynamics of calcium are therefore of considerable interest. We present preliminary results showing an ongoing effort to implement a three dimensional reaction-diffusion model of a cardiac cell over multiple time and space scales. Calcium transporters on the cellular membrane are crucial in modulating concentrations via influx and ejection and are of particular interest. Typically, ion channels provide influx routes and prove computationally expensive to represent due to their relatively small space and time scales. We show current work testing implementation of analytical solutions giving calcium concentration profiles in ion channel neighborhoods combined with numerical simulations of calcium diffusion away from these channels.