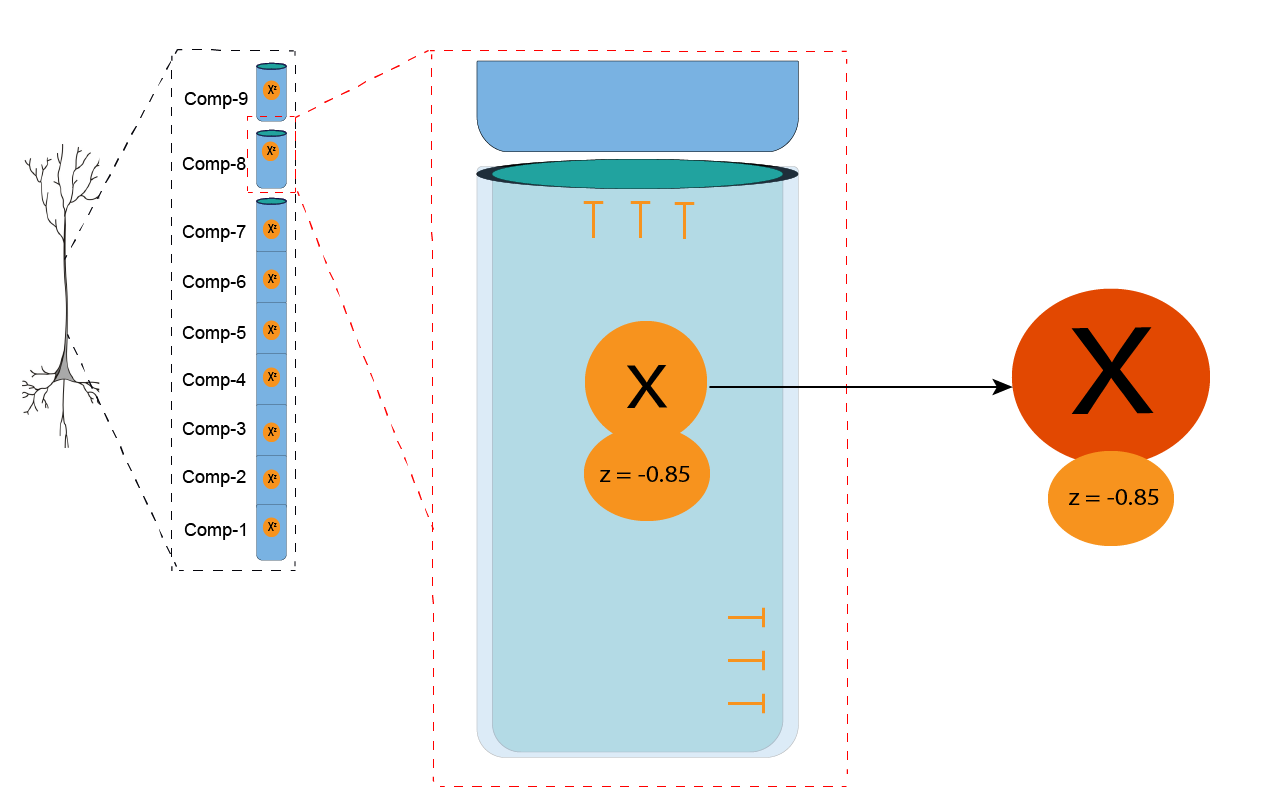
## Changing impermeant anion concentration sets local compartment volume with fixed electrical properties of the dendrite

I evaluated the impact of changing impermeant anion (IA) concentration in a single compartment by deploying a nine-compartment model linked in a longitudinal fashion by electro-diffusion. The concentration of impermeant anions, “[X] “, in compartment number 8 was increased at a fixed rate of 10mM/min between 120 -140s whilst keeping the average charge (valence) of impermeant anions in all compartments constant (z = - 0.85) (Schematic 1).

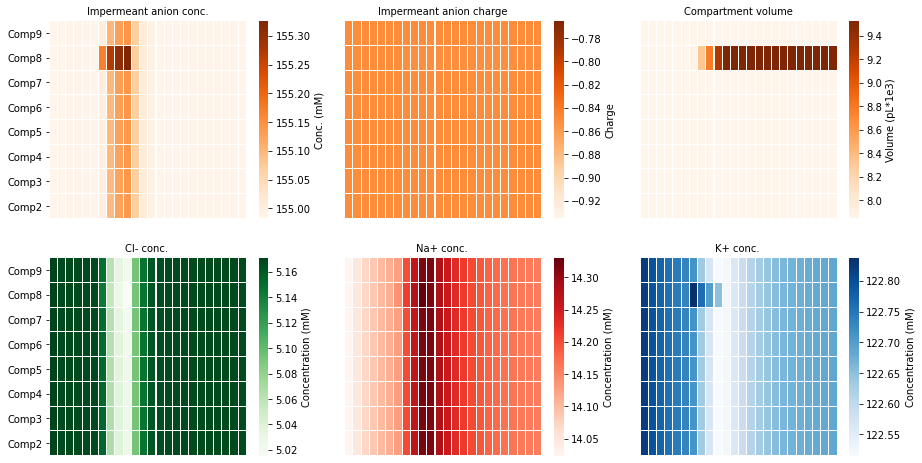
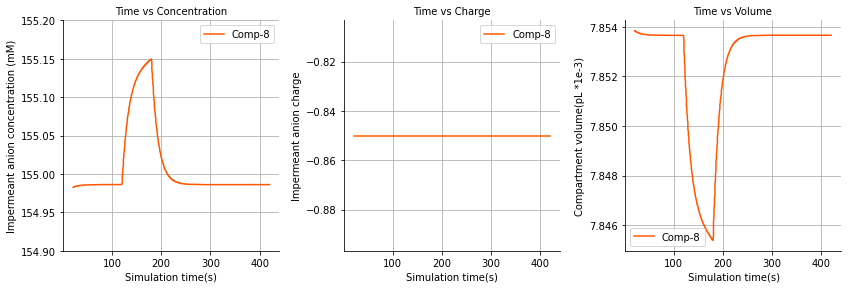


**Schematic 1:** Impermeant anion concentration altered in compartment 8, while impermeant anion charge (z) is held constant.

In the top row of Figure 1A below, shown in orange, simulation time is plotted on the x-axis and is compared to impermeant anion concentration, charge, and volume for compartment 8 before, during and after the increase in impermeant anion concentration.

In the middle row these same parameters were compared with the other compartments in the model using heatmaps. Although the concentration of impermeant anions was manipulated only in compartment 8, there were uniform changes in the concentration of IAs in all the other compartments likely due to small volume changes occurring due to the movement of ions. The volume of compartment 8 showed an increase due to the addition of IAs which persisted beyond the manipulation period and subsequently reached a new higher equilibrium volume such that there is a net charge and osmolar balance.

In the bottom row the concentration of the permeant ions (Cl, Na, and K) was compared between compartments. Although there were transient changes in permeant anion concentrations in all compartments during the addition of IAs, once this addition ceased the concentrations of all permeant ions returned to their state values as predicted by the analytical solution for single compartment models.



**Figure 1A** - Increased impermeant anion concentration between 120s – 180s in compartment 8 leads to local compartment swelling while other compartments remain unchanged.

The concentrations of permeant ions (Cl, Na, K) were affected by the change in impermeant anion concentration (Figure 1B).

The concentration of impermeant anions in adjacent compartments also increased likely due to net changes related to other ions.

**Figure 1B** – Increased impermeant anion concentration in compartment 8 leads to unchanged ionic driving forces and thus no change to the excitability of the dendrite.

