# 1 Envy-You Version 1.0

This most recent version 1.0 of the envy-you code is based on the previous versions envy-you 0.1 and 0.2, the main changes being:

## 1.1 Parameters

The most important parameters that can be used to adjust the model are listed as global variables in the main script 'NVC_main.m', namely

*t_start* - start time of simulation (s)

*t_end* - end time of simulation (s)

*startpulse* - start of neuronal pulse (s)

*lengthpulse* - length of neuronal pulse (s)

*CASE* - set of coupling coefficients

*J_PLC* - EC agonist concentration ($\mu$M $s^{-1}$)

*C_Hillmann* - scaling factor for the Hai&Murphy rate constants based on **?**

*stretch_ch* - to activate/deactivate stretch-activated channels in EC and SMC

*only_Koenig* - to simulate only the Koenigsberger model (other sub-models will still be considered, but the KIR channel is set to 0)

At the end of each simulation *save_all()* is called and will give the option to save all parameters and figures in a separate folder with a time stamp.

## 1.2 Radius and wall thickness equation

The previous equations of the radius, R, and the arterial wall thickness, $h$, seemed to have led to an instability of the system at very low $J_{plc}$ values. Due to that h is now set to a fixed ratio of the radius (see 'all_fluxes.m'):

$$h = 0.1R$$

## 1.3 Hillmann coefficients

The reaction rate constants used by (**?**) are based on experiments with swine carotid arteries and there is no evidence that they can be used for human brain arteries. Within her paper (**?**) E. Hillman's could show that the hemodynamic response in rats takes place within a couple seconds, whereas with the (**?**) model we obtain maximal dilation within approximately a minute. Based on (**?**) we introduce a scaling coefficient *'C_Hillmann'*, that allows us to scale all rate constants simultaneously.

## 1.4 Figures position

All figures are now automatically placed in the main screen.

## 1.5 Coupling coefficients

The three coupling coefficients ($v_{cpl}, Ca_{cpl}, P3_{cpl}$) are chosen the following:

Table 1: All CASE's.

| | $v_{cpl}$ ($s^{-1}$) | $Ca_{cpl}$ ($s^{-1}$) | $P3_{cpl}$ ($s^{-1}$) |
|---|---|---|---|
| CASE 0 | 0 | 0 | 0 |
| CASE 1 | 0.5 | 0 | 0.05 |
| CASE 2 | 0.5 | 0.05 | 0.05 |
| CASE 3 | 0 | 0 | 0.05 |
| CASE 4 | 0.5 | 0.05 | 0 |
| CASE 5 | 0.5 | 0 | 0 |
| CASE 6 | 0 | 0.05 | 0 |
| CASE 7 | 0 | 0.05 | 0.05 |

## 1.6 Corrected mistakes

- plotting of stretch-activated channels in EC (figure 3 - EC fluxes)
- $K_7$ corrected to be $K_4$ in the differential equation for AMp (didn't change any results because $K_4 = K_7 = 0.1\ s^{-1}$)
- *v_Ca2* changed back to -24 mV (original value from **?**)

- maximal voltage coupling $v_{cpl}$ set to 0.5 $s^{-1}$ (any stronger coupling leads to EC clinging to SMC and a too low membrane potential in SMC for VOCC to open during neuronal pulse)

# References