# S2 Text. Parameterization of the 2-D computational domain

Several studies use measurements of $t\_{cyt}$ and $t\_{str}$ to quantify the resistance of the cytosol and stroma, respectively. Some studies also describe the measurements of $S\_{c}/S\_{m}$, the ratio of the chloroplast surface area facing the intercellular air space to the mesophyll surface area facing the intercellular air space. This ratio is a measure to what extent the exposed mesophyll surface is covered with chloroplasts. The aim of this section is to design a flexible geometry that can be generated by different combinations of values for anatomical parameters $t\_{str}$, $t\_{cyt}$, and $S\_{c}/S\_{m}$. For this purpose, the length of a number of boundaries ($h$, $ h\_{gap}$, $h\_{str}$) in Fig C in S1 Text has to be written as a function of these parameters.

## S2.1 Parameterization $h\_{str}$

The height of the stroma compartment $h\_{str}$ can be written as a function of $t\_{str}$:

## $$\begin{array}{c}h\_{str}=qt\_{str}\#\left(S2.1\right)\end{array}$$

## S2.2 Parameterization $h\_{gap}$

In our model, it is assumed that the 2-D computational domain is a cross section of a 3-D rectangular cuboid. Therefore, the ratio of length of the chloroplast exposed to the intercellular air space to the length of the mesophyll exposed to the intercellular air space is:

$$\begin{array}{c}\frac{h\_{str}}{h}=\frac{qt\_{str}}{h}=\frac{S\_{c}}{S\_{m}}\#\left(S2.2\right)\end{array}$$

which can be rewritten as:

$$\begin{array}{c}h=\left(\frac{S\_{c}}{S\_{m}}\right)^{-1}qt\_{str}\#\left(S2.3\right)\end{array}$$

From equations (S2.1) and (S2.2), the height of the gaps between two chloroplasts can be expressed as:

$$\begin{array}{c}h\_{gap}=h-h\_{str}=\left(\left(\frac{S\_{c}}{S\_{m}}\right)^{-1}-1\right)qt\_{str}\#\left(S2.4\right)\end{array}$$

## 2.3 Parameterization of $l$

The distance $l$ between the cell wall and the tonoplast of the computational domain can be expressed as:

$$\begin{array}{c}l=2t\_{cyt}+t\_{str}\#\left(S2.5\right)\end{array}$$