Finding $J_{waterstress}$ using the P-model

We estimate J_V as $J_{waterstress}$.

$$J_V = 4 \cdot V_{cmax} \cdot \frac{c_i + 2\Gamma^*}{c_i + K_{mm}}$$

(C from 2014 New Physiologist paper)

We assume that only c_i is effected by waterstress due to stomata closure. We ignore ~~effects~~ physiological/theoretical effects on all other parameters (V_{cmax} etc) as per Colins suggestion for simplification.

$$J_W = 4 V_{cmax} \cdot \frac{WC_i + 2\Gamma^*}{WC_i + K_{mm}}$$

where WC_i is c_i under waterstress.
We use the P-Model to find WC_i

From the P-model paper:

$$GPP = I_{abs} \cdot \varphi_0(T) \cdot \beta(\theta) \cdot m' \cdot M_c \quad (Eq\ 2, 18, 19)$$

$$A = \varphi_0 \cdot I_{abs} \cdot m' \quad (Eq\ 16)$$

So...

$$GPP = A \cdot M_c \cdot \beta(\theta)$$

and...

$$A = \min(A_j, A_c) \quad (Eq\ 1)$$

In water stress A_c is the minimum because the system is limited by Rubisco activity.

$$A_c = V_{cmax} \cdot \frac{c_i - \Gamma^*}{c_i + K} \quad (Eq\ 6, 7)$$

So...

$$GPP = V_{cmax} \cdot \frac{c_i - \Gamma^*}{c_i + K} \cdot M_c \cdot \beta(\theta)$$

Finding the $J_{waterstress}$ using the P-model (2) (clearer)

$$GPP = V_{cmax} \cdot \frac{c_i - \Gamma^*}{c_i + K} \cdot M_c \cdot \beta(\theta) = V_{cmax} \cdot \frac{wc_i - \Gamma^*}{wc_i + K} \cdot M_c$$

So... $$\frac{c_i - \Gamma^*}{c_i + K} \cdot \beta(\theta) = \frac{wc_i - \Gamma^*}{wc_i + K}$$

Let $$\frac{c_i - \Gamma^*}{c_i + K} = m_c \qquad \text{(equation 7)}$$

$$m_c \cdot \beta(\theta) = \frac{wc_i - \Gamma^*}{wc_i + K}$$

$$m_c \cdot \beta(\theta) \cdot (wc_i + K) = (wc_i - \Gamma^*)$$

$$wc_i [m_c \cdot \beta(\theta)] + K [m_c \cdot \beta(\theta)] = wc_i - \Gamma^*$$

$$K [m_c \cdot \beta(\theta)] + \Gamma^* = wc_i - wc_i [m_c \cdot \beta(\theta)]$$

$$= wc_i [1 - m_c \cdot \beta(\theta)]$$

$$\boxed{\frac{K \cdot m_c \cdot \beta(\theta) + \Gamma^*}{1 - m_c \cdot \beta(\theta)} = wc_i}$$

---

so $J_W = f(c_i, \Gamma^*, \beta(\theta))$ and constants

Still need to rerun for $\bar{\Gamma}^*$.