Table 1 Model Notation

Symbol	Definition	Value		Units	Source
		Base	$+P+CO_2^a$		
c_x	CO_2 concentrations	Varies		µM	
b_x	HCO_3^- concentrations	Varies		µM	
k_{uf}	Uncat	3.7×10^{-2}		s^{-1}	Johnson (1982)
k_{cf}	Cytoplasm	450	600	s^{-1}	Hopkinson et al. (2011)
k_{pf}	Plastid–stroma	3.7×10^{-2}		s^{-1}	Johnson (1982)
k_{yf}	Pyrenoid	1.8×10^{4}		s^{-1}	Hopkinson et al. (2011)
pH_e	Extracellular pH	8.0		–	Measured, Zhang and Byrne (1996)
pH_c	Cytoplasmic pH	7.3		–	Herve et al. (2012)
pH_p	Chloroplast pH	8.15		–	Anning et al. (1996)
U_c	HCO_3^- uptake rate into cytoplasm	Varies		mol $cell^{-1}$ s^{-1}	
V_{m-Bc}	Maximal HCO_3^- uptake rate into cytoplasm	4×10^{-18}		mol $cell^{-1}$ s^{-1}	Badger et al. (1994)
K_{m-Bc}	Half-saturation constant for HCO_3^- uptake into cytoplasm	140		µM	Knauf et al. (2002)
U_p	HCO_3^- uptake rate into chloroplast	Varies		mol $cell^{-1}$ s^{-1}	
V_{m-Bp}	Maximal HCO_3^- uptake rate into chloroplast	7×10^{-17}		mol $cell^{-1}$ s^{-1}	Hopkinson et al. (2011)
K_{m-Bp}	Half-saturation constant for HCO_3^- uptake into chloroplast	140	35	µM	Knauf et al. (2002)
P	Photosynthetic rate (CO_2 fixation rate)	Varies		mol $cell^{-1}$ s^{-1}	
m_R	RubisCO content	6.3×10^{-18}	7.0×10^{-18b}	mol $cell^{-1}$	Losh et al. (2013)
k_{cat}	RubisCO turnover rate	3.4		s^{-1}	Whitney et al. (2001)
K_{m-R}	RubisCO half-saturation constant for CO_2	41		µM	Whitney et al. (2001)
f_{c-c}	CO_2 mass transfer coefficient from solution to cytoplasm	2.3×10^{-8}		cm^3 s^{-1}	Hopkinson et al. (2011)
f_{c-p}	CO_2 mass transfer coefficient from cytoplasm to chloroplast	6×10^{-9}		cm^3 s^{-1}	Hopkinson et al. (2011)
f_{c-y}	CO_2 mass transfer coefficient from chloroplast to pyrenoid	6.7×10^{-10}	4.0×10^{-10b}	cm^3 s^{-1}	Hopkinson et al. (2011)
f_{b-y}	HCO_3^- mass transfer coefficient from chloroplast to pyrenoid	7.5×10^{-9}		cm^3 s^{-1}	Hopkinson et al. (2011)
V_e	Volume of extracellular solution	1		cm^3	Measured
V_c	Cytoplasmic volume	6.6×10^{-11}		cm^3 $cell^{-1}$	Measured, Coulter counter
V_p	Chloroplast stroma volume	6.0×10^{-12}		cm^3 $cell^{-1}$	Hopkinson et al. (2011)
V_y	Pyrenoid volume	2.1×10^{-13}		cm^3 $cell^{-1}$	Hopkinson et al. (2011)
N	Cell number	Varies		cell	Measured, Coulter counter

[a] parameters are the same in the naïve and refined models unless listed

[b] f_{c-y} was decreased and m_R was increased in the base+P model to increase the C_i-saturated rate of photosynthesis