Supporting information for "The stomatal response to rising CO_2 concentration and drought is predicted by a hydraulic trait-based optimization model"

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1 Table of experiment design.

Table S1 Default setting of the growth chamber and the settings for the treatments. Row [CO_2] was the chamber CO_2 concentration; row RH was the relative humidity; row Soil indicated whether the trees were watered (W for watered, NW for not watered); row PAR was the light intensity; row T_{air} was the chamber air temperature; row Day time was the time frame for light in the chamber. Column Default and Treatment stages showed the default settings of the chamber. The P_{pd} and P_{leaf} indicated that predawn water potential and leaf xylem pressure were measured for that treatment. P_{pd} was measured once for the [CO_2] and RH treatment. P_{pd} was measured after each stage in the drought treatment. PAR was set at a constant 1000 µmol m^{-2} s^{-1} during the day and air temperature was set at 25 °C throughout the experiment.

Treatment	Default	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Note
$[CO_2]$ (ppm)	400	800 P_{leaf}	600	400 P_{leaf}	300	200 P_{leaf}	Same day P_{pd} for all stages
RH (%)	55	75 P_{leaf}	65	55 P_{leaf}	45	35 P_{leaf}	Same day P_{pd} for all stages
Soil	W	W P_{pd}, P_{leaf}	NW P_{pd}	NW P_{pd}, P_{leaf}	NW P_{pd}	NW P_{pd}, P_{leaf}	Different P_{pd} for all stages
PAR (μmol m^{-2} s^{-1})	1000						Constant throughout the experiment
T_{air} (°C)	25						
Day time	8 am to 6 pm						

2 Table of traits for each tree.

Table S2 Top: vulnerability curves for root, stem, and leaf elements. The "B" and "C" are parameters of the Weibull function used to fit vulnerability curve data. Resistance partition is the resistance of each segment as a percentage of the whole plant resistance. The VCs were same for each tree. Below: tree-specific traits. In the column "Note", C, D, and P denoted if the tree was

used in the CO_2, RH, and drought treatment, respectively.

Vulnerability curves:

	B	C	Resistance partition
Root	1.879	2.396	53.7%
Stem	2.238	9.380	24.3%
Leaf	1.897	2.203	22.0%

Traits for each individual:

Tree	Note	Root K_{max}	Stem K_{max}	Leaf K_{max}	K_{max}	V_{cmax}	J_{max}	LaBa
		kg h^{-1} MPa^{-1} m^{-2}				μmol CO_2 m^{-2} s^{-1}		m^2 m^{-2}
1	CD	2589.516	5725.834	6304.174	1389.961	54.947	107.505	5663
2	CDP	3478.758	7692.092	8469.033	1867.275	69.840	128.280	5663
3	C	1043.779	2307.963	2541.080	560.264	59.719	104.973	2648
4	CP	2893.333	6397.621	7043.815	1553.039	64.618	118.730	5663
5	C	1451.979	3210.557	3534.840	779.371	50.968	68.376	2648
6	CP	2241.282	4955.832	5456.397	1203.041	96.578	202.987	5663
7	D	2161.774	4780.028	5262.836	1160.364	12.794	24.004	2648
8	DP	2494.907	5516.638	6073.847	1339.178	67.316	126.116	5663
9	DP	2055.616	4545.295	5004.394	1103.382	65.145	122.198	5663
10	DP	1869.949	4134.758	4552.390	1003.723	75.456	141.540	5663

3. Example of tree response to the environment

Fig. S1 Xylem water potential (P_x) and percentage loss of conductance (PLC) in root, stem, and leaf at different environmental conditions. Panel A and B: responses of P_x and PLC to atmospheric [CO_2] at a soil water potential of -0.68 MPa (mean value for six trees). Panel C and D: responses to atmosphere vapor pressure deficit (VPD) for a soil water potential of -0.72 MPa (mean value for six trees). Panel E and F: responses to soil water potential. The black line in each panel represents when whole tree transpiration is 0 meaning only gravity governs the xylem water potential drop. Vulnerability curve parameters of root, stem, and leaf are from Table S1. The K_{max}, V_{cmax}, J_{max}, and LaBa are the average values of the ten trees from Table S1. Stem height is set to 1 m.
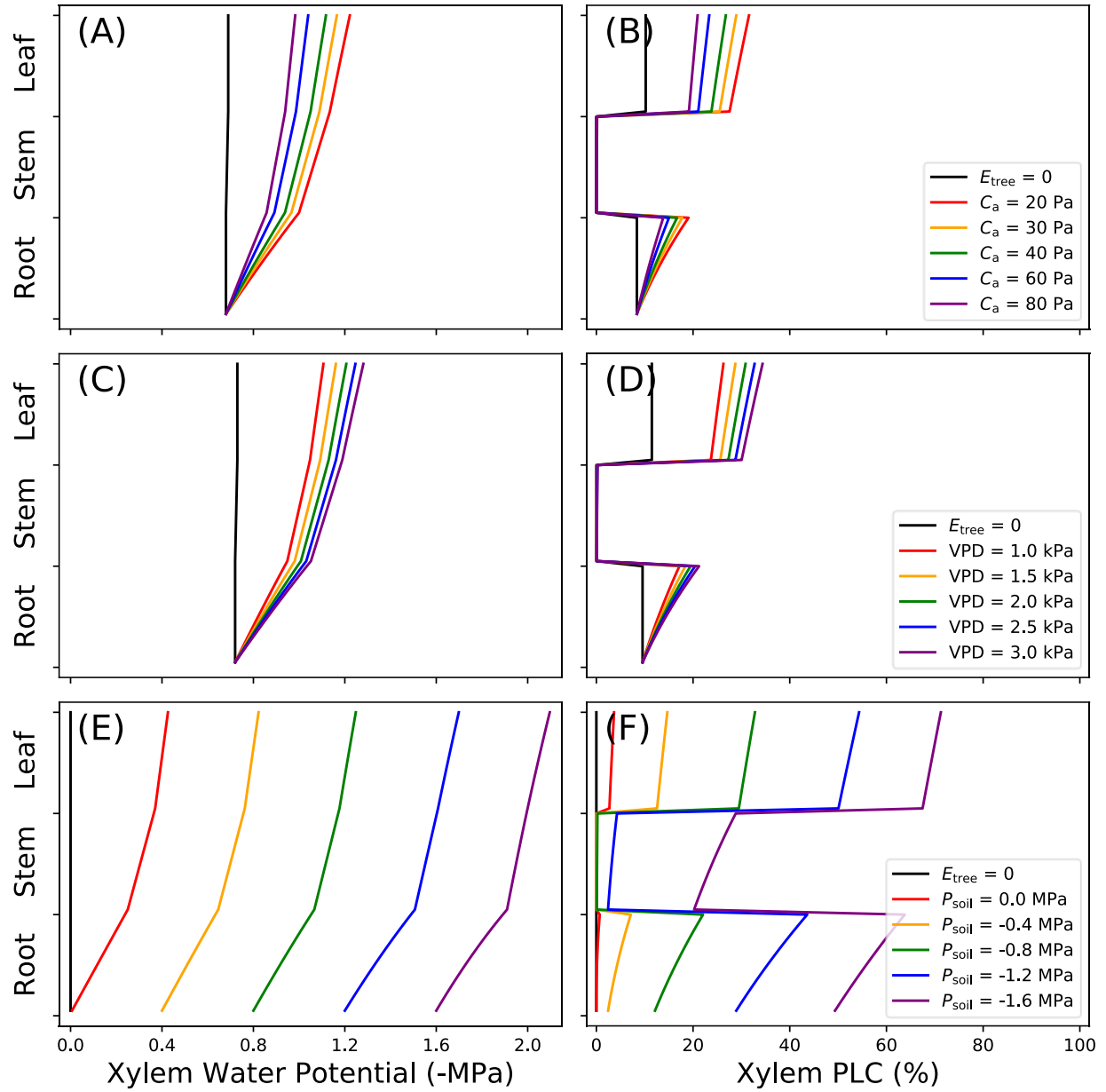
4 Correlation of V_{cmax} and J_{max}

Fig. S2 Correlation between maximal carboxylation rate at 25 °C (V_{cmax}) and maximal electron transport at 25 °C (J_{max}). The dashed line plots the linear regression (y = 1.86x, R^2 = 0.992).