

## SUPPLEMENTARY DATA

TABLE S1. Degrees of freedom (df) and *P*-values for each measurement day from all experiments, with measurement days analysed as individually by ANOVA in SAS PROC MIXED. All [CO<sub>2</sub>] and temperature treatments were included in the models as fixed effects, and blocks were included in the models as random effects where appropriate. Asterisks indicate a significant interaction according to alpha levels specified in Table S2 (below). Significance does not indicate direction of change, which varies for some treatments and is presented graphically (Figs S1–S4, also below).

<b>CO<sub>2</sub> × temperature experiment: <math>K_{\text{leaf}}</math></b>								
Trial-days after planting		df ( $K_{\text{leaf}}$ )	<i>P</i> -value ([CO <sub>2</sub> ])	<i>P</i> -value (temp)	<i>P</i> -value (interaction)			
1-31		9	0.8370	0.4702	0.7713			
1-36		8	0.7611	0.1971*	0.9054			
1-43		9	0.4832	0.1310*	0.3168			
2-36		9	0.4943	0.9612	0.2377			
2-38		5	0.1853*	0.3320	0.6379			
2-43		11	0.3158	0.5706	0.9015			
<b>CO<sub>2</sub> × temperature experiment: <math>A</math></b>								
Trial-days after planting		df ( $A$ )	<i>P</i> -value ([CO <sub>2</sub> ])	<i>P</i> -value (temp)	<i>P</i> -value (interaction)			
1-31		12	0.0014*	0.7064	0.5322			
1-36		12	0.0056*	0.8554	0.2595			
1-43		12	0.8328	0.8066	0.3396			
2-36		12	0.0013*	0.2435	0.1314*			
<b>CO<sub>2</sub> × temperature experiment: <math>g_s</math></b>								
Trial-days after planting		df ( $g_s$ )	<i>P</i> -value ([CO <sub>2</sub> ])	<i>P</i> -value (temp)	<i>P</i> -value (interaction)			
1-31		12	0.3534	0.8294	0.5449			
1-36		12	<0.0001*	0.9076	0.0409*			
1-43		12	<0.0001*	0.9593	0.6133			
2-36		12	0.5515	0.6453	0.1604*			
<b>Temperature chamber experiment</b>								
Days after planting	df ( $K_{\text{leaf}}$ )	<i>P</i> -value ( $K_{\text{leaf}}$ )	df ( $\Psi_{\text{leaf}}$ )	<i>P</i> -value ( $\Psi_{\text{leaf}}$ )	df ( $A$ )	<i>P</i> -value ( $A$ )	df ( $g_s$ )	<i>P</i> -value ( $g_s$ )
32	11	0.2773	18.6	0.3605	19	0.5641	19	0.0746
39	16	0.2098	19	0.7628	19	0.3134	19	0.0364*
41	21	0.0396*	--	--	--	--	--	--
<b>[CO<sub>2</sub>] field experiment</b>								
Days after planting		df		<i>P</i> -value				
32		11.6		0.7051				
50		17.7		0.7475				
<b>Temperature field experiment</b>								
Days after planting		df		p-value				
64		18.3		0.9585				
86		17.2		0.1626				

TABLE S2. Optimal alpha and beta values used for hypothesis testing. Values were calculated according to Mudge *et al.* (2012); inputs were degrees of freedom from data set and Cohen's  $f^2$  of 0.35, chosen *a priori*. Degrees of freedom for each data set can be found in the upper right corner of graphs.

Degrees of freedom	Optimal alpha	Optimal beta
5	0.28	0.34
8	0.23	0.28
9	0.22	0.26
11	0.19	0.23
12	0.18	0.21
12.1	0.18	0.21
14	0.16	0.19
16	0.15	0.17
17.2	0.14	0.15
17.7	0.13	0.15
18.3	0.13	0.14
18.6	0.13	0.14
19	0.12	0.14
21	0.11	0.12

FIG. S1. Leaf hydraulic conductance ( $K_{leaf}$ ), photosynthesis ( $A$ ), and stomatal conductance ( $g_s$ ) for the  $CO_2 \times$  temperature experiment. Data is shown for individual measurement days. Two trials of the experiment were run. In the first trial, measurements were taken 31, 36, and 43 days after planting. In the second trial, measurements were taken 36, 38, and 43 days after planting. Growth  $[CO_2]$  was 400 ppm (ambient) or 700 ppm (elevated), and growth temperature was  $27^\circ C$  (ambient) or  $31^\circ C$  (elevated).  $K_{leaf}$  was measured for leaves sampled before sunrise, while  $A$  and  $g_s$  were measured at midday on the previous day. Asterisks denote significant treatments and interactions for individual days. Lower-case letters indicate pair-wise differences between treatment combinations, where they are significant.

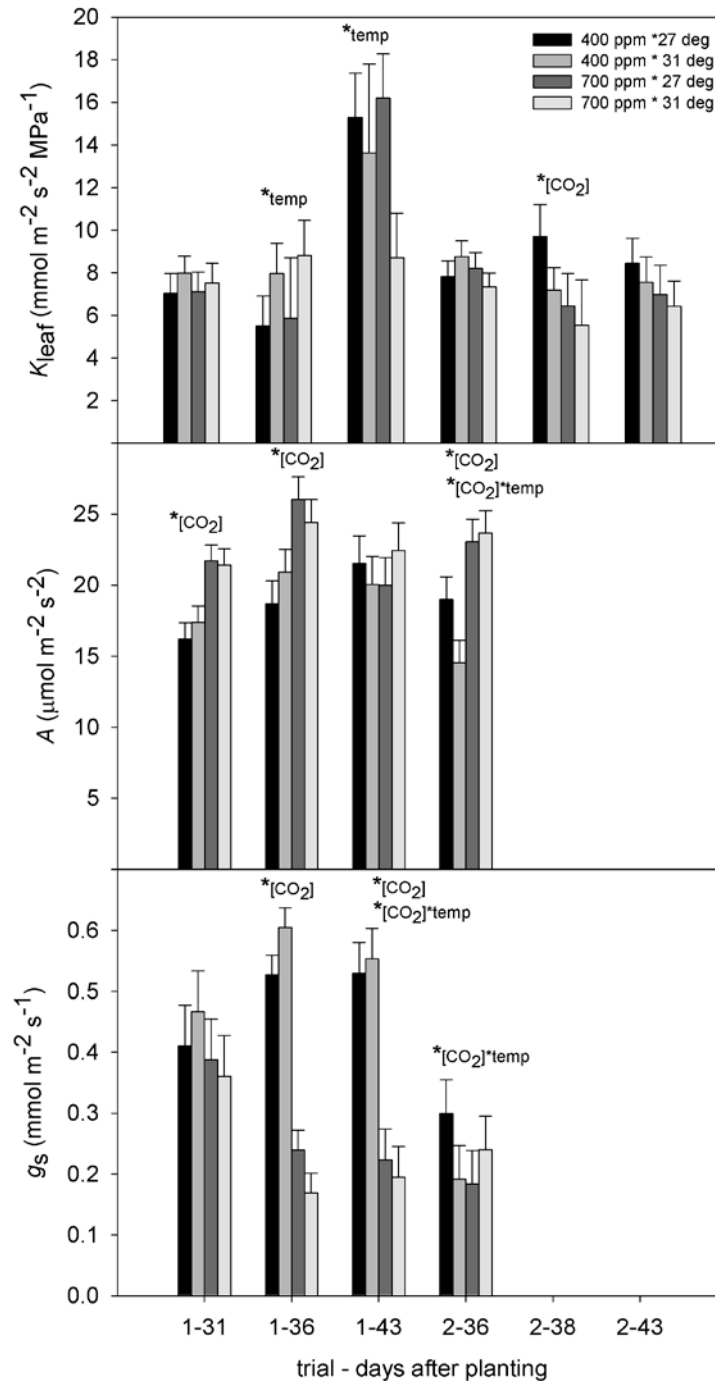


FIG. S2. Leaf hydraulic conductance ( $K_{\text{leaf}}$ ), midday leaf water potential ( $\Psi_{\text{leaf}}$ ), photosynthesis ( $A$ ), and stomatal conductance ( $g_s$ ) for the temperature-only chamber experiment. Measurements were taken 32, 39, and 41 days after planting. Data is shown for individual measurement days. Daytime growth temperature was 25° C (ambient) or 30° C (elevated).  $K_{\text{leaf}}$  was measured for leaves sampled before daytime growth lights turned on, while  $\Psi_{\text{leaf}}$ ,  $A$ , and  $g_s$  were measured at midday on the previous day. Asterisks denote a significant temperature effect for individual days.

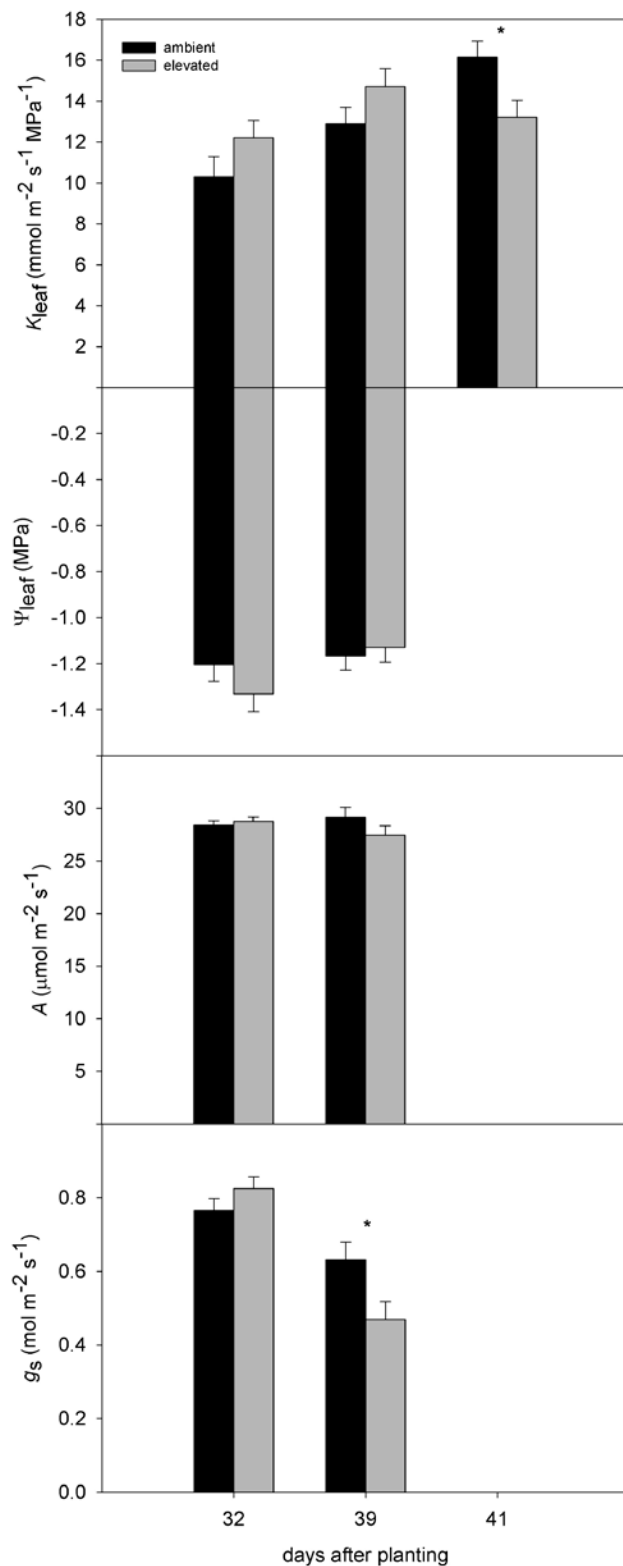


FIG. S3. Leaf hydraulic conductance ( $K_{\text{leaf}}$ ) for field-grown soybean under free-air  $[\text{CO}_2]$  enrichment (FACE). Data is shown for individual measurement days. Leaves were sampled pre-sunrise from ambient and elevated  $[\text{CO}_2]$  plots on two days.  $[\text{CO}_2]$  did not affect  $K_{\text{leaf}}$  on either measurement day. Alpha levels for each hypothesis test can be found in Table S1.

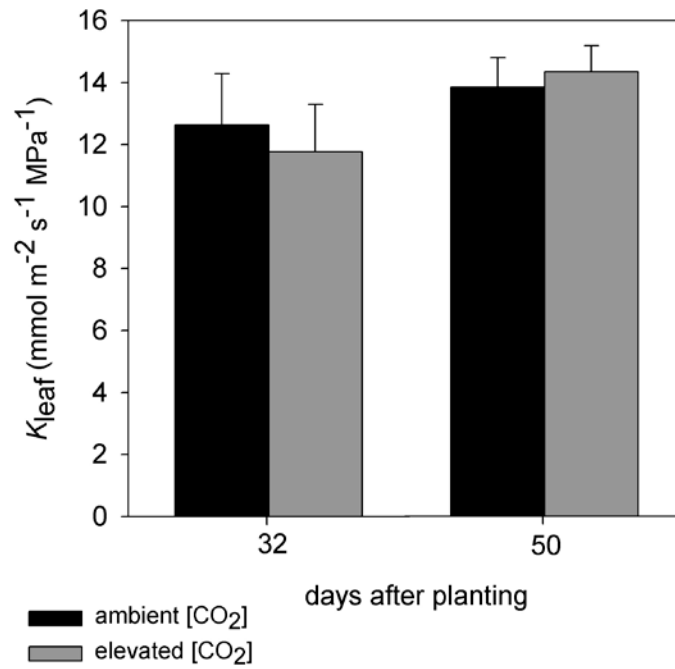


FIG. S4. Leaf hydraulic conductance ( $K_{\text{leaf}}$ ) for field-grown soybean. Data is shown for individual measurement days. Temperature was ambient or elevated with infrared heaters ( $3.5^{\circ}\text{C}$  over ambient). Leaves were sampled pre-sunrise from control plots and heated plots. Temperature did not affect  $K_{\text{leaf}}$  on either measurement day.

