Supplemental Table 2. Performance comparison between predictive models built with either the entire training population (full model) or 80% of the training population (80% model). Also shown is the correlation generated by applying the 80% model to predict trait values of the samples removed from the training population.

Trait	Model parameter	Full model	80% model	80% model applied to removed samples (R^2)
Chlorophyll	Cross validation R^2	0.850	0.849	0.874
	RMSE	3.329	3.296	
	Model bias	0.0012	0.0161	
	Training population	268	214	
	Model components	8	9	
N content	Cross validation R^2	0.956	0.954	0.961
	RMSE	0.234	0.234	
	Model bias	-0.0014	-0.0017	
	Training population	203	162	
	Model components	10	10	
SLA	Cross validation R^2	0.777	0.767	0.803
	RMSE	1.116	1.095	
	Model bias	0.0005	0.0031	
	Training population	182	146	
	Model components	11	11	
Sucrose content	Cross validation R^2	0.622	0.583	0.725
	RMSE	0.945	0.943	
	Model bias	-0.0210	-0.0242	
	Training population	61	49	
	Model components	5	5	
$\boldsymbol{V_{max}}$	Cross validation R^2	0.654	0.666	0.592
	RMSE	6.595	6.385	
	Model bias	-0.0073	-0.0153	
	Training population	214	171	
	Model components	7	7	

Supplemental Table 3. Analysis of variance (ANOVA) degrees of freedom (df), *F* value and significance level (*p*) for measured and partial least squares regression (PLSR) modeled leaf traits. Inbred and hybrid genotypes B73, Mo17 and B73 x Mo17 were included in the analysis. Chl: chlorophyll content, N: leaf N content, V_{max}: [CO_2]-saturated rate of photosynthesis, SLA: specific leaf area

		Measured			PLSR_modeled		
		df	F	*p*	df	F	*p*
Chl	Genotype	2	15.31	<0.0001	2	30.85	<0.0001
	O_3	1	2.53	0.122	1	1.07	0.308
	Gen x O_3	2	0.63	0.538	2	0.05	0.955
N	Genotype	2	3.22	0.050	2	5.86	0.006
	O_3	1	0.21	0.648	1	1.74	0.195
	Gen x O_3	2	1.12	0.338	2	1.27	0.293
V_{max}	Genotype	2	5.76	0.009	2	8.06	0.002
	O_3	1	5.40	0.029	1	4.80	0.039
	Gen x O_3	2	0.84	0.442	2	1.13	0.338
SLA	Genotype	2	22.99	<0.0001	2	20.36	<0.0001
	O_3	1	7.06	0.012	1	2.96	0.095
	Gen x O_3	2	5.31	0.010	2	8.66	0.001

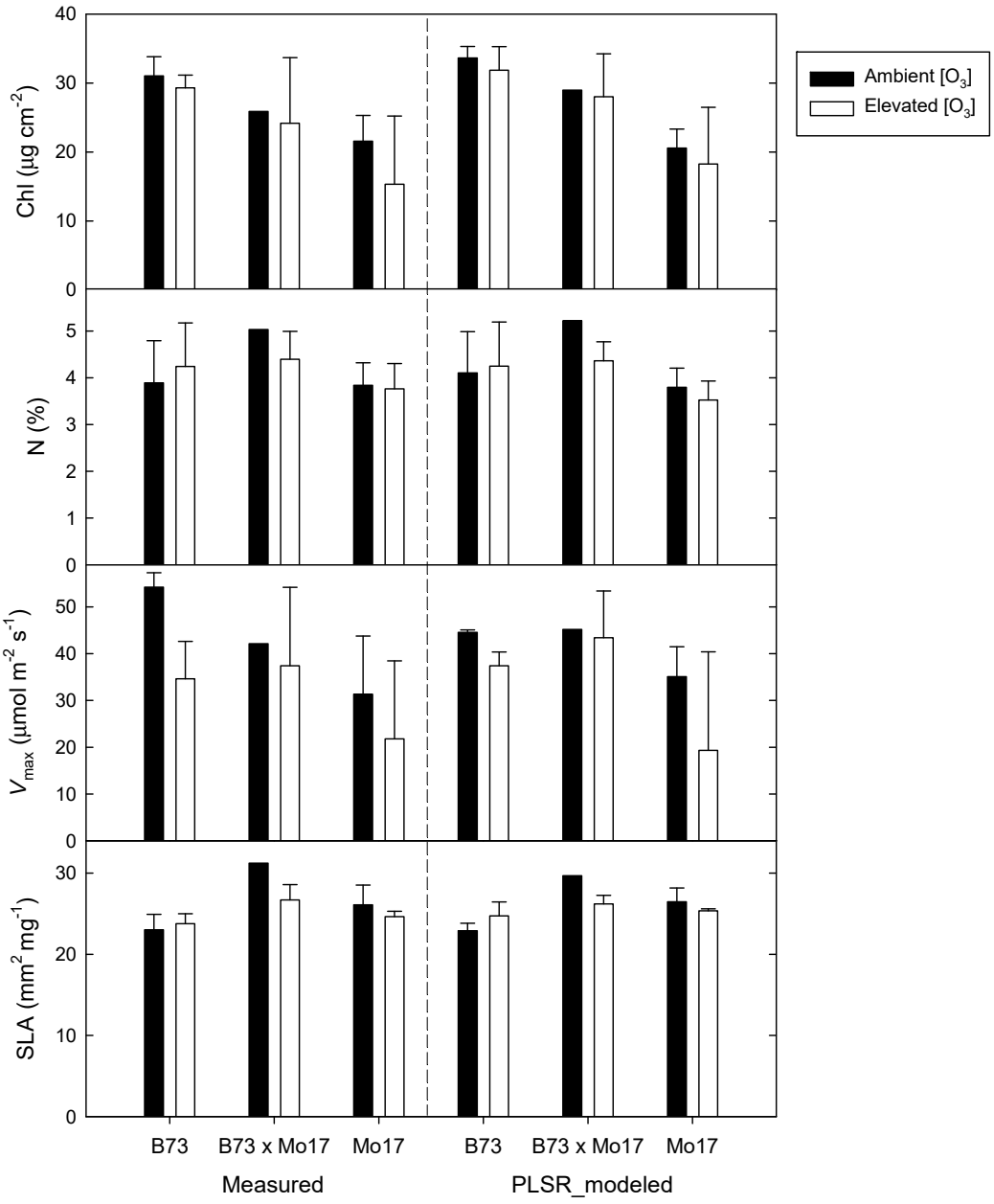
Supplemental Table 4. List of inbred and hybrid maize genotypes grown at ambient (~40 ppb) and elevated [O_3] (~100 ppb) in the 2013, 2014 and 2015 growing seasons.

2013				2014		2015
3316	CI66	Ia5125	NC336	4226	B73xB97	B73
3811	CI90C	IHP	NC338	B10	B73xCML103	C123
4226	CM105	Il14H	NC350	B103	B73xCML228	CML333
A214N	CM37	ILP	NC354	B52	B73xCML247	HP301
A239	CM7	K148	NC356	B73	B73xCML277	IL14H
A4415	CML10	K4	NC358	B79	B73xCML322	M37W
A6	CML103	K64	NC360	B97	B73xCML333	MO17
A619	CML108	KI11	NC362	C123	B73xCML52	MS71
A632	CML154Q	KI14	NC366	CH70130	B73xCML69	NC338
A634	CML158Q	KI3	NC368	CI21E	B73xHp301	OH43
A635	CML218	KI43	ND246	CM7	B73xIl14H	B73xC123
A641	CML220	KI44	OH40B	CML103	B73xKi11	B73xCML333
A654	CML228	KY21	OH43	CML218	B73xKi3	B73xHP301
A659	CML247	KY226	OH603	CML228	B73xKy21	B73xIL14H
A661	CML254	KY228	OH7B	CML247	B73xM162W	B73xM37W
A679	CML277	L578	OS420	CML277	B73xM37W	B73xMO17
A680	CML287	LH82	P39	CML322	B73xMo17	B73xMS71
A682	CML314	M14	PA875	CML333	B73xMo18W	B73xOH43
AB28A	CML322	M162W	PA880	CML52	B73xMS71	
B10	CML323	M37W	PA91	CML69	B73xNC350	
B103	CML328	Mo17	PH207	CO125	B73xNC358	
B104	CML331	MO18W	PHG47	F6	B73xOh43	
B105	CML333	MO1W	R168	H99	B73xOh7B	
B164	CML341	MO45	R177	Hp301	B73xP39	
B2	CML38	MO46	R4	Il14H	B73xTx303	
B37	CML5	MO47	SC213R	Ki11	B73xTzi8	
B46	CML52	MP339	SC357	Ki3	B73xB97	
B52	CML61	MS1334	SD44	Ky21	B73xCML103	
B57	CML69	MS71	T234	M162W		
B64	CML91	MT42	TX303	M37W		
B73	CML92	N192	TX601	Mo17		
B73-bm1	CO106	N28HT	TZI10	Mo18W		
B73-bm2	CO125	N6	TZI16	MS1334		
B73-bm3	CO255	NC222	TZI25	MS71		
B73-bm4	DE811	NC230	TZI8	NC230		
B73HTRHM	E2558W	NC232	TZI9	NC250		
B75	EP1	NC236	U267Y	NC258		
B76	F2834T	NC250	VA102	NC338		
B77	F44	NC258	VA14	NC350		
B79	F6	NC260	VA17	NC358		
B84	F7	NC262	VA26	ND246		
B97	FBLA	NC264	VA35	Oh43		
C103	GA209	NC294	VA59	Oh7B		
C123	H49	NC298	VA85	P39		
C49A	H84	NC300	VA99	Tx303		
CH70130	H99	NC302	VAW6	TZI16		
CH9	HI27	NC304	W182B	TZI25		

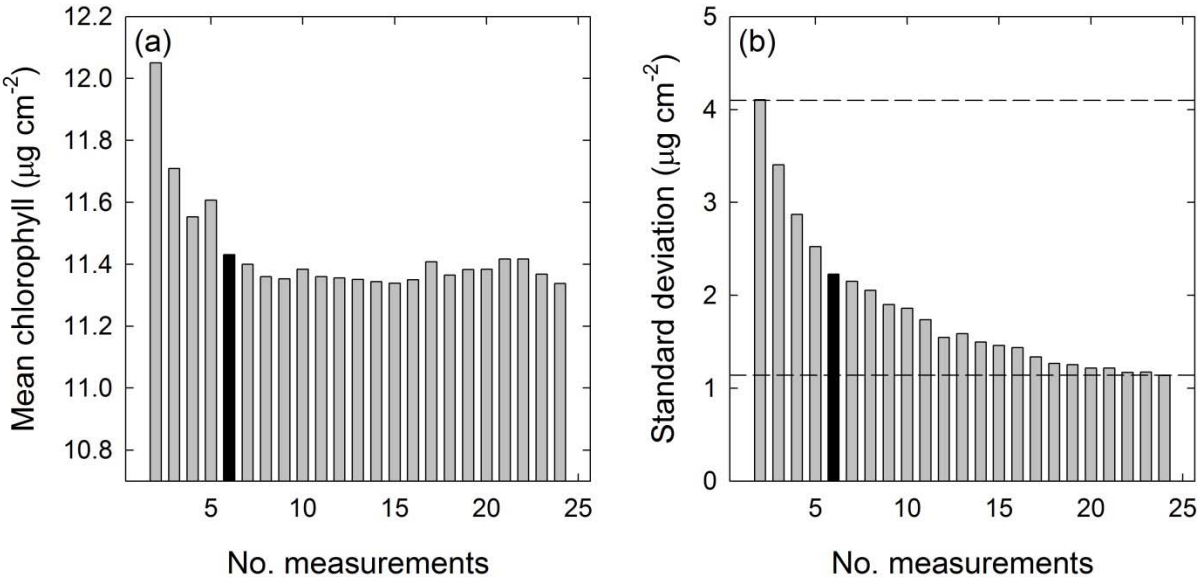
CI21E	HP301	NC306	W22	Tzi8	
CI28A	HY	NC314	W64A	TZI9	
CI31A	I137TN	NC318	WF9	VA14	
CI64	I205	NC320		VA17	
				W64A	

Supplemental Table 5. Seasonal average daily [O_3] exposure at the SoyFACE facility in 2013, 2014 and 2015.

	2013	**2014**		**2015**	
	Inbred	Inbred	Hybrid	Inbred	Hybrid
Ambient [O_3]					
8 hr ave (nL L^{-1})	40.80	40.04	40.04	39.81	39.81
AOT40 (ppm h)	4.54	4.87	4.87	4.86	4.86
SUM06 (ppm h)	0.87	3.55	3.55	2.91	2.91
Elevated [O_3]					
8 hr ave (nL L^{-1})	70.85	69.68	70.21	62.30	61.64
AOT40 (ppm h)	34.86	39.12	38.19	29.37	28.93
SUM06 (ppm h)	56.38	63.72	62.29	47.28	47.04



Supplemental Figure 1. Mean measured and PLSR-modeled leaf traits +/- 1 standard deviation for maize genotypes B73, B73 x Mo17 and Mo17. Genotypes were grown in the field at ambient and elevated [O_3] and sampled for both 'gold-standard' measurements of leaf traits and for leaf reflectance from which PLSR-modeled traits were estimated.



Supplemental Figure 2. Bootstrap estimate of mean chlorophyll content and standard deviation from 1 to 24 spectra taken on an individual leaf. Based on this analysis, it was determined that 6 spectra per leaf were required to accurately estimate the mean value and reduce the standard deviation and amount of time needed to gather one replicate.