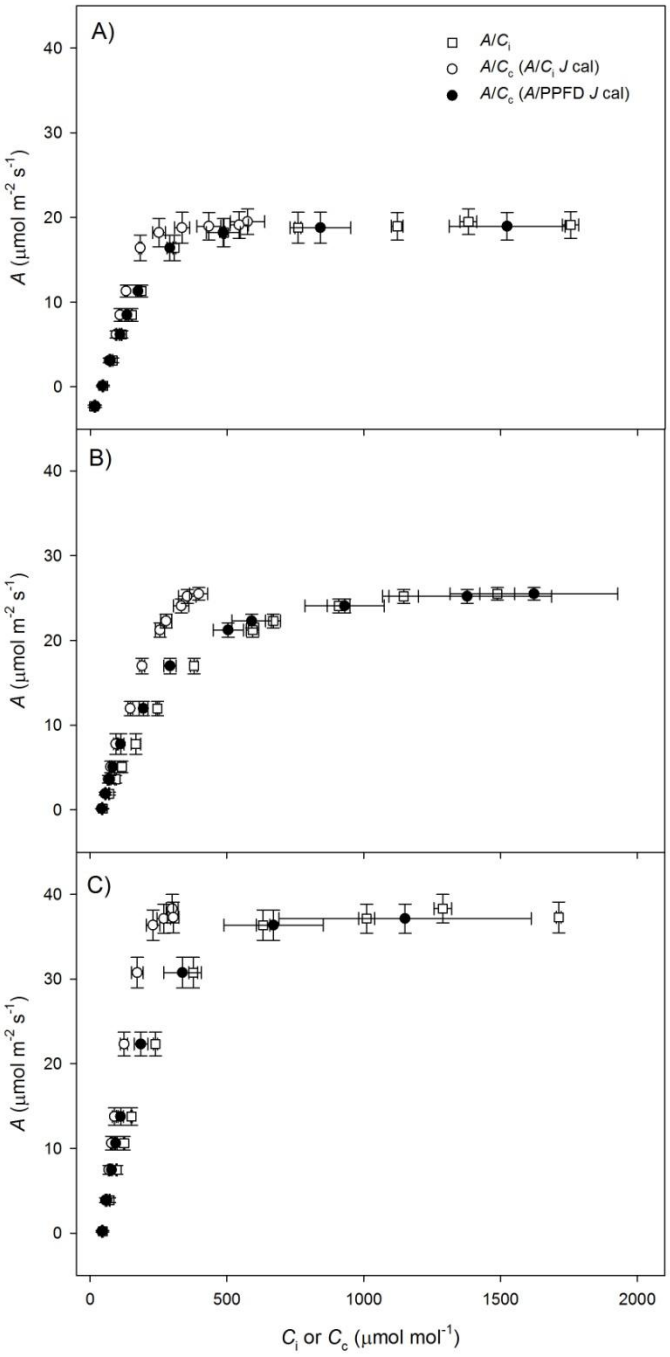

Figure S1. Response of net photosynthesis (*A*) to sub-stomatal CO_2 concentrations (C_i, empty squares) or to chloroplast CO_2 concentration (C_c) where C_c was obtained using the *A*/*C*i *J* calibration (empty circles) or the A/PPFD *J* calibration (filled circles) in (A) *Nicotiana tabacum*; (B) *Coffea arabica* and (C) *Limonium gibertii*. Values are averages ±SE of four to six replicates, depending on the species. Note that the A/C_icurves were repeated to facilitate the comparison with their respective A/C_c curves.

Table S1. Corrections in CO_2 and water vapour flux rates because of diffusion leaks. The leak in A (μmol CO_2 m^{-2} s^{-1}) was calculated as following: Leak in A = ($A_{corrected}$ -$A_{non\text{-}corrected}$); after, we calculated the relative proportion of the leak in relation to the non-corrected value (A_{nc}) as % of A_{nc} = (| Leak in A | / | A_{nc} |)*100. Leaks for water vapour affecting leaf transpiration (E) were calculated accordingly but note the different units (mmol H_2O m^{-2} s^{-1}).$C_a$refers to the chamber CO_2concentration. Corrections are shown only for A/C_i curves; for A/PPFD curves, there were not major differences among species and the average % of A_{nc} at PPFD>400 and PPFD<400 μmol m^{-2} s^{-1} were *c.* 2 and 5%, respectively. % of E_{nc} were in the same magnitude as those shown for A/C_i curves.

	N. tabacum				*C. arabica*				*L. gibertii*			
C_a	Leak in A	% of A_{nc}	Leak in E	% of E_{nc}	Leak in A	% of A_{nc}	Leak in E	% of E_{nc}	Leak in A	% of A_{nc}	Leak in E	% of E_{nc}
50	0.88	117.9	0.09	1.6	0.78	122.9	0.10	5.4	0.88	143.7	0.07	1.6
100	0.80	36.1	0.09	1.6	0.68	62.4	0.09	5.8	0.81	51.5	0.06	1.6
150	0.73	13.6	0.09	1.6	0.58	22.0	0.09	6.1	0.74	18.5	0.07	1.6
200	0.65	8.5	0.09	1.6	0.47	11.7	0.09	6.5	0.65	9.2	0.07	1.6
250	0.59	5.5	0.09	1.6	0.27	4.2	0.09	6.8	0.57	5.9	0.07	1.6
400	0.33	2.1	0.09	1.6	0.06	0.7	0.10	5.2	0.39	2.2	0.07	1.6
600	0.06	0.3	0.09	1.6	-0.35	2.0	0.10	5.3	0.07	0.3	0.07	1.6
900	-0.43	2.3	0.08	1.6	-0.97	4.4	0.10	5.5	-0.37	1.1	0.07	1.6
1300	-1.04	5.3	0.07	1.6	-1.81	7.0	0.10	6.0	-1.02	2.9	0.07	1.6
1600	-1.48	7.1	0.06	1.6	-2.43	8.8	0.10	6.4	-1.49	4.0	0.07	1.6
2000	-2.09	10.0	0.06	2.0	-3.26	11.4	0.09	6.9	-2.12	5.6	0.08	2.0

Table S2. Averaged mesophyll conductance (g_m, mol CO_2 m^{-2} s^{-1}) for the interval of C_i between 100 and 350 μmol mol^{-1} and the punctual g_m at ambient CO_2 concentration (400 μmol mol^{-1}).% DE is the percentage of data excluded after the restriction is applied (g_m restricted to the range of $0<g_m<1$). The αβ for the *J* calibrations are those described in Table 2 in addition to the standard αβ of 0.42. $R_{dark}/2$ was used for these g_m estimates.

		C_i (100-350)		Amb CO_2 (400 μmol mol^{-1})	
		% DE	g_m	% DE	g_m
N. tabacum	Φ_{PSII}/Φ_{CO2} (*A*/*C*i)	6	0.287 ± 0.037	0	0.152 ± 0.015
	Φ_{PSII}/Φ_{CO2} (PPFD>400)	88	0.504 ± 0.262	100	-
	Yin (PPFD<400)	94	0.377	100	-
	Yin (PPFD<400 C_i>500)	25	0.458 ± 0.074	0	0.273 ± 0.048
	Standard	75	0.514 ± 0.118	75	0.461
C. arabica	Φ_{PSII}/Φ_{CO2} (*A*/*C*i)	0	0.124 ± 0.007	0	0.133 ± 0.014
	Φ_{PSII}/Φ_{CO2} (PPFD>400)	6	0.191 ± 0.029	20	0.269 ± 0.084
	Yin (PPFD<400)	0	0.220 ± 0.043	0	0.353 ± 0.122
	Yin (PPFD<400 C_i>500)	0	0.108 ± 0.006	0	0.110 ± 0.009
	Standard	44	0.332 ± 0.085	80	0.945
L. gibertii	Φ_{PSII}/Φ_{CO2} (*A*/*C*i)	0	0.228 ± 0.020	0	0.208 ± 0.026
	Φ_{PSII}/Φ_{CO2} (PPFD>400)	21	0.406 ± 0.083	50	0.247 ± 0.053
	Yin (PPFD<400)	43	0.245 ± 0.024	50	0.239 ± 0.048
	Yin (PPFD<400 C_i>500)	0	0.246 ± 0.022	0	0.231 ± 0.034
	Standard	36	0.296 ± 0.065	50	0.226 ± 0.042

Table S3. Same as Table S2, but $R_{ACi/ACc}$, the respiration estimate from combined A/C_i and A/C_c curves proposed in this study,was used in the g_m estimates instead of $R_{dark/2}$.

		C_i (100-350)		Amb CO_2 (400 μmol mol^{-1})	
		% DE	g_m ± SE	% DE	g_m ± SE
N. tabacum	Φ_{PSII}/Φ_{CO2} (A/Ci)	0	0.213 ± 0.021	0	0.132 ± 0.014
	Φ_{PSII}/Φ_{CO2} (PPFD>400)	50	0.468 ± 0.064	50	0.435 ± 0.111
	Yin (PPFD<400)	88	0.560 ± 0.317	100	-
	Yin (PPFD<400 C_i>500)	0	0.324 ± 0.041	0	0.190 ± 0.024
	Standard	38	0.484 ± 0.073	0	0.400 ± 0.105
C. arabica	Φ_{PSII}/Φ_{CO2} (A/Ci)	0	0.117 ± 0.006	0	0.125 ± 0.012
	Φ_{PSII}/Φ_{CO2} (PPFD>400)	0	0.186 ± 0.029	0	0.276 ± 0.080
	Yin (PPFD<400)	0	0.176 ± 0.023	0	0.248 ± 0.062
	Yin (PPFD<400 C_i>500)	0	0.103 ± 0.005	0	0.106 ± 0.008
	Standard	31	0.312 ± 0.065	80	0.378
L. gibertii	Φ_{PSII}/Φ_{CO2} (A/Ci)	0	0.214 ± 0.014	0	0.198 ± 0.020
	Φ_{PSII}/Φ_{CO2} (PPFD>400)	7	0.371 ± 0.044	25	0.393 ± 0.137
	Yin (PPFD<400)	7	0.428 ± 0.058	0	0.447 ± 0.199
	Yin (PPFD<400 C_i>500)	0	0.228 ± 0.013	0	0.216 ± 0.025
	Standard	7	0.367 ± 0.040	25	0.352 ± 0.118

Values are means ± standard error (SE) of four to sixA/C_icurves per species. The SE was calculated according to the points that remained in each C_i interval after the restriction was applied. Same statistics for Table S1.When SE is not shown, only one observation remained as valid.

Table S4. Mesophyll conductance (g_m, mol CO_2 m^{-2} s^{-1}) for several intervals of C_i and percentage of data excluded (DE) after applying two restrictions (g_m restricted to the range of $0<g_m<1$ mol CO_2 m^{-2} s^{-1} and dC_c/dA of 10-50, the Harley *et al*. (1992) criteria). The A/C_i or A/PPFD J calibration refers to the Φ_{PSII}/Φ_{CO2} (A/C_i) or A/PPFD methods, respectively. $R_{ACi/Acc}$ is the light respiration estimate from the combined A/C_i and A/C_c curves proposed in this study, and $R_{dark/2}$ is the dark respiration divided per two to account for the observed reduction in R_{dark} under light (Niinemets *et al*., 2005).

	A/C_i J calibration				A/PPFD J calibration			
	$R_{ACi/ACc}$		$R_{dark/2}$		$R_{ACi/ACc}$		$R_{dark/2}$	
	g_m	DE (%)	g_m	DE (%)	g_m	DE (%)	g_m	DE (%)
				N. tabacum				
C_i<100	0.274 ± 0.099	67	0.261	92	0.238 ± 0.092	67	0.199 ± 0.043	75
C_i 100-350	0.183 ± 0.036	56	0.328 ± 0.115	75	0.588 ± 0.042	88	-	100
C_i>350	0.035 ± 0.008	70	0.038 ± 0.008	70	0.321 ± 0.057	90	0.392 ± 0.388	90
				C. arabica				
C_i<100	-	100	0.297	94	0.195 ± 0.056	75	0.219 ± 0.047	44
C_i 100-350	0.116 ± 0.010	44	0.127 ± 0.010	38	0.200 ± 0.037	6	0.194 ± 0.030	13
C_i>350	0.057 ± 0.004	29	0.065 ± 0.005	41	0.152 ± 0.038	91	0.115 ± 0.008	94
				L. gibertii				
C_i<100	0.230 ± 0.026	13	0.271 ± 0.052	13	0.287 ± 0.015	33	0.285 ± 0.118	53
C_i 100-350	0.278 ± 0.023	86	0.329 ± 0.018	86	0.352 ± 0.063	21	0.398 ± 0.114	36
C_i>350	0.019 ± 0.000	95	0.019 ± 0.000	95	0.034 ± 0.007	84	0.041 ± 0.008	79

Values are the means ± standard error (SE) of four to six A/C_i curves per species. The SE was calculated according to the points that remained in each C_i interval after applying the restriction.When SE is not shown, only one valid observation remained.

Table S5. Maximum carboxylation rate of Rubisco (V_{cmax}, μmol CO_2 m^{-2} s^{-1}) and maximum electron transport rate from gas-exchange (J_{max}, μmol e^- m^{-2} s^{-1}) as affected by the different *J* calibrations. All photosynthetic parameters were calculated on a C_i basis from A/C_i curves and on a C_c basis from A/C_c curves using measured Rubisco kinetic constants (Γ^*, K_c and K_o) in this study (as reported in Table 1). For these V_{cmax} and J_{max}, $R_{dark/2}$ was used. For comparison, see the values calculated with $R_{ACi/Acc}$ in Table 5. Note that the parameters calculated on a C_i basis are independent of *J* calibration.

		On C_c basis		On C_i basis	
		V_{cmax}	J_{max}	V_{cmax}	J_{max}
N. tabacum	Φ_{PSII}/Φ_{CO2} (*A*/*C*i)	102.5 ± 9.1	103.2 ± 10.5	77.4 ± 4.7	90.6 ± 7.3
	Φ_{PSII}/Φ_{CO2} (PPFD>400)	76.1 ± 5.8	84.9 ± 7.3		
	Yin (PPFD<400)	67.4 ± 6.3	79.8 ± 7.9		
	Yin (PPFD<400 C_i>500)	89.3 ± 7.8	94.1 ± 9.3		
	Standard	76.8 ± 7.0	85.9 ± 8.5		
C. arabica	Φ_{PSII}/Φ_{CO2} (*A*/*C*i)	73.0 ± 3.7	136.6 ± 7.1	43.2 ± 2.2	111.9 ± 3.3
	Φ_{PSII}/Φ_{CO2} (PPFD>400)	57.0 ± 2.6	112.7 ± 5.3		
	Yin (PPFD<400)	58.3 ± 2.9	116.0 ± 5.7		
	Yin (PPFD<400 C_i>500)	83.0 ± 3.8	146.3 ± 7.2		
	Standard	42.7 ± 2.4	97.4 ± 4.8		
L. gibertii	Φ_{PSII}/Φ_{CO2} (*A*/*C*i)	132.7 ± 13.4	228.5 ± 8.7	71.7 ± 2.8	176.4 ± 6.2
	Φ_{PSII}/Φ_{CO2} (PPFD>400)	101.0 ± 9.5	177.0 ± 5.8		
	Yin (PPFD<400)	97.6 ± 10.3	177.6 ± 6.4		
	Yin (PPFD<400 C_i>500)	127.1 ± 12.2	216.6 ± 7.8		
	Standard	100.9 ± 10.6	181.9 ± 6.6		

Values are means ± standard error of four to six A/C_i or A/C_c curves per species.