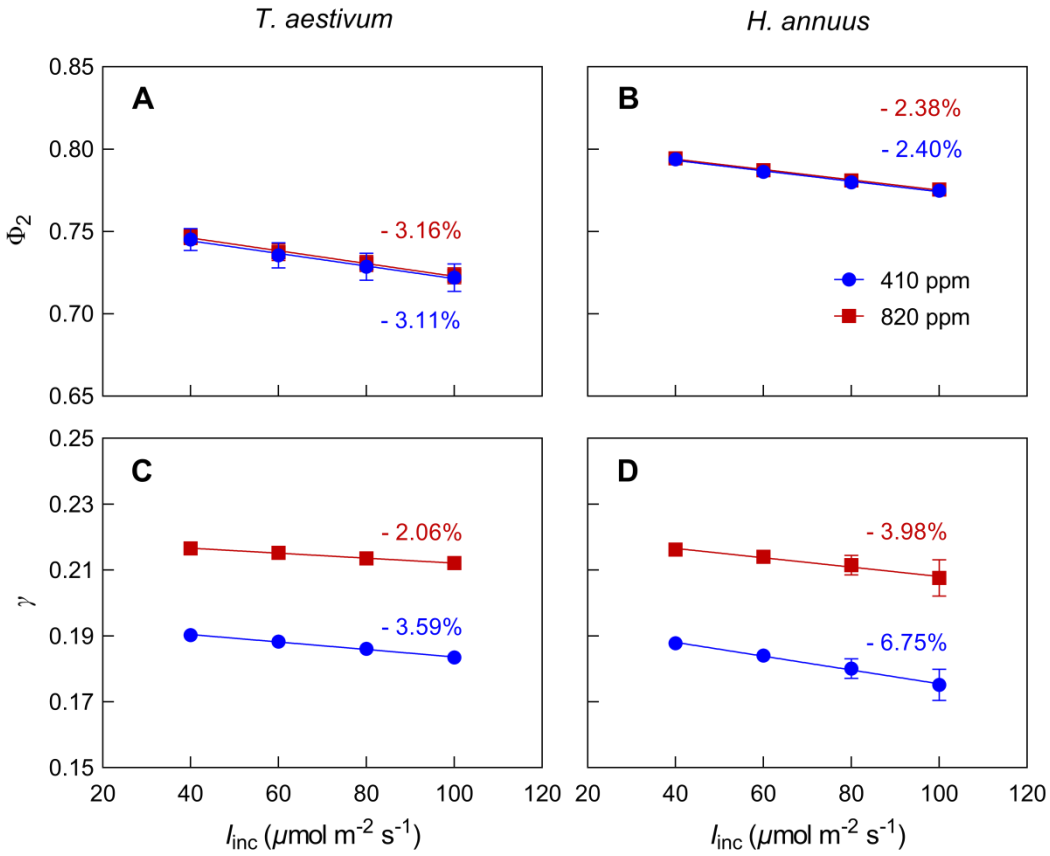
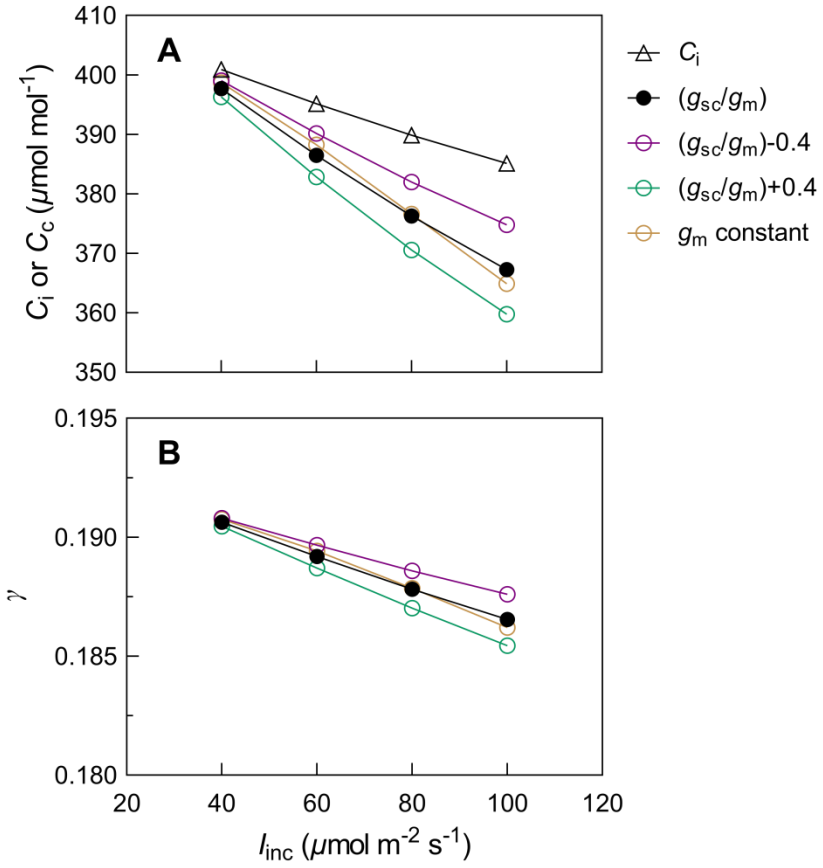
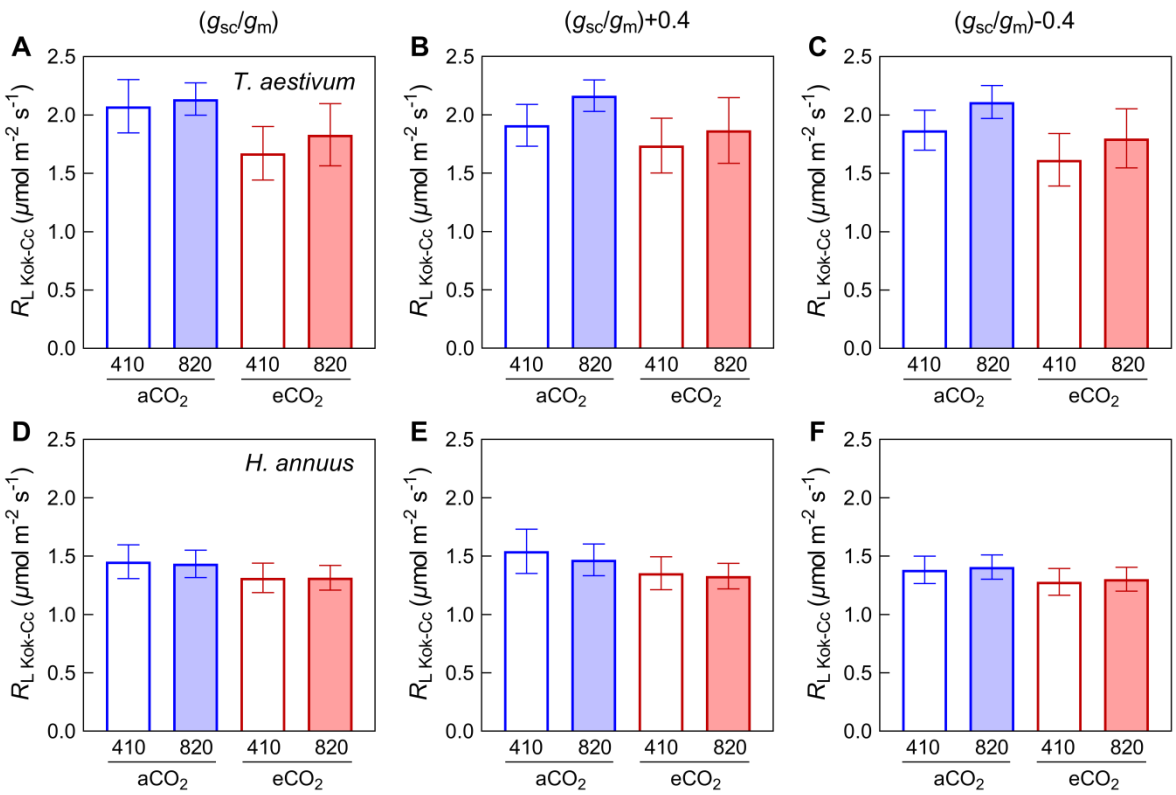
Supplementary data



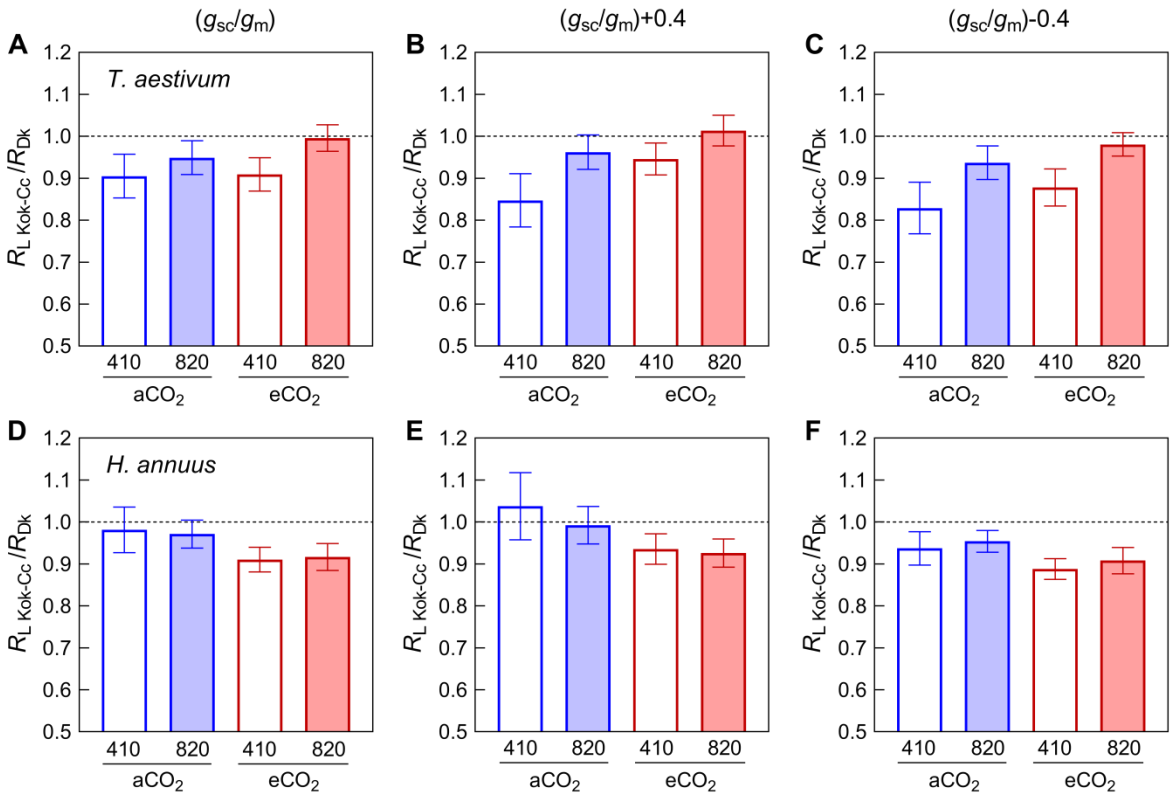
Supplemental Figure S1 Photochemical efficiency of photosystem II (Φ_2) and γ (the lumped parameter in Eqn 2) in response to the incident irradiance (I_{inc}) for wheat (*T. aestivum*) and sunflower (*H. annuus*). Plants were measured at gaseous conditions of 410 (blue circles) or 820 ppm (red squares) CO_2 in the leaf chamber. Data are averaged over treatments of growth CO_2, and were shown as means ± SE (n=12). The numbers represent the relative changes in Φ_2 and γ with the increase of I_{inc} from 40 to 100 μmol m^{-2} s^{-1}.



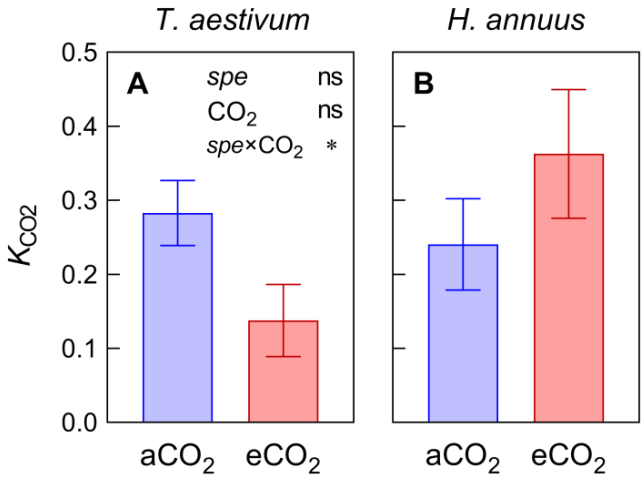
Supplemental Figure S2 Sensitivity tests on chloroplastic CO_2 concentration (C_c) and γ (the lumped parameter in Eqn 2) in response to the incident irradiance (I_{inc}). The tests were performed using the data of a leaf of wheat (*T. aestivum*) under ambient CO_2 concentration by varying the ratio of stomatal conductance for CO_2 to mesophyll conductance (g_{sc}/g_m) in a range of ± 0.4 or assuming a constant mesophyll conductance (g_m) value of 0.2 mol m^{-2} s^{-1}.



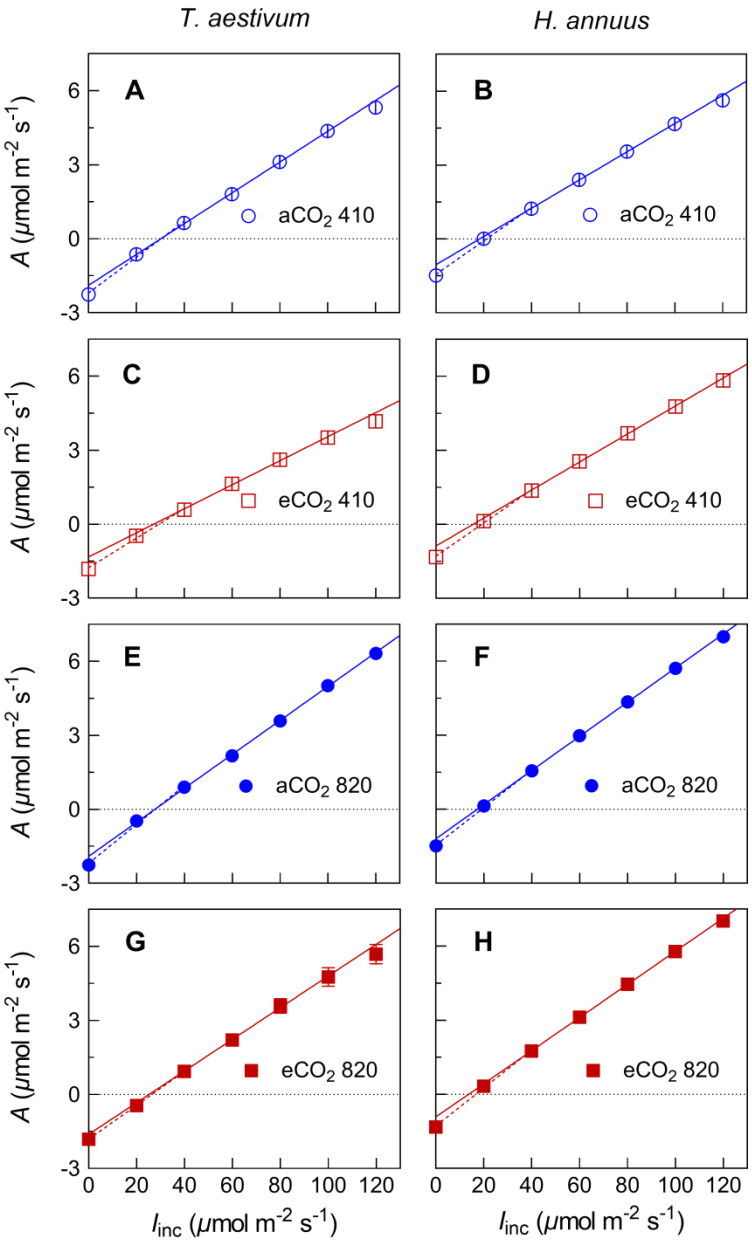
Supplemental Figure S3 Sensitivity test on respiration in the light estimated by the Kok-C_c method ($R_{L\ Kok\text{-}Cc}$) of growth CO_2 treatments (aCO_2 and eCO_2) and measurement conditions (410 and 820 ppm) for wheat (*T. aestivum*) and sunflower (*H. annuus*) by varying the ratio of stomatal conductance for CO_2 to mesophyll conductance (g_{sc}/g_m). A and D, $R_{L\ Kok\text{-}Cc}$ using the estimated g_{sc}/g_m. B and E, $R_{L\ Kok\text{-}Cc}$ using g_{sc}/g_m+0.4. C and F, $R_{L\ Kok\text{-}Cc}$ using g_{sc}/g_m-0.4. Data are means ± SE (n=5-6)



Supplemental Figure S4 Sensitivity test on ratio of respiration in light to respiration in the dark ($R_{L\ Kok\text{-}Cc}/R_{Dk}$) of growth CO_2 treatments (aCO_2 and eCO_2)and measurement conditions (410 and 820 ppm) for wheat (*T. aestivum*) and sunflower (*H. annuus*) by varying the ratio of stomatal conductance for CO_2 to mesophyll conductance (g_{sc}/g_m). A and D, $R_{L\ Kok\text{-}Cc}/R_{Dk}$ using the estimated g_{sc}/g_m. B and E, $R_{L\ Kok\text{-}Cc}/R_{Dk}$ using g_{sc}/g_m+0.4. C and F, $R_{L\ Kok\text{-}Cc}/R_{Dk}$ using g_{sc}/g_m-0.4. Data are means ± SE (n=5-6)



Supplemental Figure S5 Effects of growth CO_2 treatments (aCO_2 and eCO_2) on the cuvette leak coefficient for CO_2 (K_{CO2}) of intact leaves of wheat (*T. aestivum*) and sunflower (*H. annuus*). Data are mean ± SE (n=6). Asterisks indicate significant differences of ANOVA tests (*, P<0.05).



Supplemental Figure S6 Net CO_2 assimilation rate (A) in response to the incident irradiance (I_{inc}) for wheat (*T. aestivum*) and sunflower (*H. annuus*). Solid lines are the linear regressions of A vs I_{inc} observed in an I_{inc} range of 40 to 100 μmol m^{-2} s^{-1}; dashed lines are those observed in an I_{inc} range of 0 to 40 μmol m^{-2} s^{-1}. Meaning of symbols of different CO_2 treatments and measurement conditions are shown in Fig. 2.