**The file ‘ABA\_soilVWC\_middaygasex09\_11.csv’ contains the following columns:**

**A: Observation number**

**B: block**: Block (replicate) number

**C: ring**: Treatment plot number

**D: CO2:** CO2 treatment assignment as 385 (ambient CO2) or 585 (elevated CO2)

**E: H2O:** Precipitation treatment assignment as con (control precipitation) or dry (reduced precipitation)

**F: DOY:** Julian date or day of year

**G: Year**

**H: xylem\_ABA:** Xylem abscisic acid (ABA) content (nmol ml-1)

**I: CO2\_num:** Binary treatment assignment, with 0 indicating ambient CO2 and 1 indicating elevated CO2.

**J: Ci:** Leaf internal CO2 concentration (μmol mol-1)

**K: CO2xyl:** Interaction term between binary CO2 variable and xylem ABA.

**L: pH:** pH of xylem exudate samples that were used to measure xylem ABA content

**M: log\_ABA\_corr:** Log-transformed leaf ABA content (ng g-1 dry weight, corrected for starch)

**N: VWCthru75:** Average soil volumetric water content (H2O%v/v) for each plot at 5-75 cm soil depth

**O: CO2\_VWC75:** Interaction term between binary CO2 variable and average soil water content at 5-75 cm soil depth.

**P:logxyl:** Log-transformed xylem ABA (nmol ml-1)

**The file ‘ABA\_regression\_analysis.sas’ uses the regression procedure in SAS to carry out the following regression analyses:**

Fig 5A: Leaf internal CO2 concentration (column J) plotted against xylem ABA (column H)

FigS10A: Log-transformed leaf ABA, corrected for starch (column M) plotted against soil H2O%v/v at 5-75 cm soil depth (column N)

FigS10B: Log-transformed xylem ABA (column P) plotted against soil H2O%v/v at 5-75 cm soil depth (column N)

FigS10C: Xylem pH (column L) plotted against soil H2O%v/v at 5-75 cm soil depth (column N)

For the regression in Fig. 5A, the full model tests the effects of xylem ABA, CO2 treatment, and the xylem ABA\* CO2 interaction on Ci. The treatment-specific regressions were used to yield R2 values for the Ci vs. xylem ABA regression for each treatment separately.

For each of the regressions in Extended Data Fig. 8, the full model analyzes effect of CO2 treatment, the effect of soil H2O%v/v, and the interactive effect of CO2 and soil H2O%v/v on the measured parameters of leaf ABA, xylem sap ABA, and xylem sap pH. The treatment-specific regressions were used to yield R2 values for each of the ABA parameters vs. soil H2O%v/v regression for each treatment separately.

**The file ‘Fig\_5B\_Fig\_5C\_raw\_data.xlsx’** contains the following data columns related to A/Ci response curves measured in the laboratory, superimposed with the operating Ci of the corresponding treatment plot measured the previous day in the field:

**A: Ci:** Leaf internal CO2 concentration

**B: 2009 1CP:** Photosynthetic carbon assimilation (A) data for each Ci value for an ambient CO2 plot (ring 1, control precipitation), on a date when plants did not experience drought stress and hence had low xylem ABA concentration (~0.02 nmol ml-1)

**C: 2009 14CP:** Photosynthetic carbon assimilation (A) data for each Ci value for an elevated CO2 plot (ring 14, control precipitation), on a date when plants did not experience drought stress and hence had low xylem ABA concentration (~0.02 nmol ml-1)

**D: 2011 10RP:** Photosynthetic carbon assimilation (A) data for each Ci value for an ambient CO2 plot (ring 10, reduced precipitation), on a date when plants experienced drought stress and hence had relatively high xylem ABA concentration (~0.3-0.4 nmol ml-1)

**E: 2011 15RP:** Photosynthetic carbon assimilation (A) data for each Ci value for an elevated CO2 plot (ring 15, reduced precipitation), on a date when plants experienced drought stress and hence had relatively high xylem ABA concentration (~0.3-0.4 nmol ml-1)

**G: Year**

**H: Plot:** Ring number and precipitation treatment assignment (CP=control precipitation; RP=reduced precipitation)

**I: CO2:** CO2 treatment

**J: DOY:** Julian date or day of year

**K: Operating Ci:** Leaf internal CO2 concentration (Ci) measured in the field within 1 day of A/Ci response curve measurements

**L: A:** Predicted photosynthetic carbon assimilation (A) for the given operating Ci.