**Workshop** **exercises**

1. **Fitting ACI and AQ curves to get the photosynthetic parameters Vcmax and Jmax**

**Material Folder:** ACi\_curve\_fitting

**Excel Tool:** 2016\_05\_19\_Curve\_fitting\_model\_2.0.xlsx

References:

Sharkey, T. D. (2015). What gas exchange data can tell us about photosynthesis. *Plant, Cell & Environment*, *39*(6), 1161-1163

**Steps**

1 Open the LICOR data file, copy the CO2 uptake(A) and intercellular CO2 (Ci) data.

2 Paste the data to the excel tool (Tobacco sheet).

3 Change the Tleaf to measured leaf temperature.

4 Excel Data menu -> Use Solver to minimize cell C37.

5 Check the output (Vcmax, Jmax, Rd and the figure).

**Tips:**

1 Sort the data before paste to the excel tool (Ci from low to high)

2 ???

**Additional exercises:**

AQ curve fitting using the Light curve sheet.

Read the reference paper

**Another available tool:**

R package:

<https://eloch216.github.io/PhotoGEA/index.html>

1. **Using FvCB model to regenerate the ACI curve.**

**Material Folder:** FvCB\_model

**Steps**

1. Open the SimACI.m file using MATLAB
2. In the Editor window, change the Vcmax, Jmax and Rd values to the estimated values from the exercise 1 (SimACI.m Line 1-3)
3. Run the script by pressing the Run button or type SimACI.m in the Command window (change the workpath to current folder).
4. Check the output.

**Additional exercises:**

1. Try to generate an AQ curve.
2. Read the reference paper.
3. **Dynamic photosynthesis model.**

**Material Folder:** Dynamic\_model

The input and output of the model.

**Input:**

**Environment.txt**---Environmental parameters

**Light150050.txt**---Dynamic light input (light changes between 1500 and 50 µmol m-2 s-1

**DynamicParameter\_Cassava**.txt---Dynamic photosynthesis parameters of cassava. Parameters: Cultivar, Vcmax25, Jmax25, kd, Ki, Ball-Berry Slop, Ball-Berry Intercept

**EnzymeVmax.txt**---maximum rate of photosynthetic parameters (Zhu et al. 2007)

**Output:**

**Figure 1:** Light (µmol m-2 s-1), Ci (µmol mol-1), Leaf temperature(°C), stomata conductance (), CO2 assimilation rate (A, µmol m-2 s-1) and Transpiration rate (µmol m-2 s-1) changes with time

**Figure 2:** Concentration of Calvin-Bensen cycle metabolite (mM)

**Steps**

1. Chage the work path to Dynamic\_model folder
2. Open SimTest.m in MATLAB
3. Run the script by pressing the Run button or type SimTest.m in the Command window.
4. Check the two output figures.
5. Change parameter Pst and PRca (SimTest.m) to 0 🡪 Run the SimTest.m again

**Additional exercises:**

1. Try to change the light inputs 🡪 to get different photosynthetic responses.
2. Change enzyme activities.