NCERA-101 Station Report 2022

About:

LI-COR Environmental is a leading environmental technology innovator for plant physiology, ecosystem, soil, light, water, and greenhouse gas research. LI-COR scientists and engineers are closely involved in the scientific community through extensive internal R&D; global collaborations with leading scientists; presentations at scientific conferences, workshops, and seminars; and publishing in leading scientific journals. By maintaining close relationships with academic, governmental, and industrial research institutions, LI-COR develops products that are at the forefront of modern technology for research in the biological and environmental sciences.

New Facilities and Equipment:

Dynamic Assimilation™ Technique with the LI-6800 Portable Photosynthesis System
The Dynamic Assimilation Technique, based on a reformulation of the traditional assimilation equation, takes measurements when chamber conditions are not at steady state, so you can record faster CO_2 response curves and survey measurements.

GPS, Leaf Angle and Barcode Generator with the LI-600 Porometer/Fluorometer
The same LI-600 Porometer/Fluorometer that delivers rapid and precise stomatal conductance and chlorophyll *a* fluorescence measurements now includes a GPS receiver and accelerometer/magnetometer for determining a leaf's angle of incidence to the sun, the main driver of photosynthetic activity.

Figure 1: LI-6800 Portable Photosynthesis System and LI-600 Porometer/Fluorometer

Accomplishment Summaries:

LI-6800 Portable Photosynthesis System: The LI-6800, equipped with the 6800-01A Fluorometer, is the only instrument capable of the Dynamic Assimilation Technique. It allows you to collect data for full response curves in a fraction of the time required by steady state measurements. In contrast with the RACiR method, the Dynamic Assimilation Technique does not depend on empirical corrections and is traceable to first principles of gas exchange measurements.

LI-600 Porometer/Fluorometer: The LI-600 accelerometer/magnetometer measures three variables–heading, pitch, and roll–and the GPS receiver records leaf location and solar position. The LI-600 software uses these data to calculate the angle of incidence (its orientation to the sun at a given time and place) for each leaf measurement, allowing researchers to evaluate a plant's environmental status more thoroughly. A new barcode generator in the desktop software allows for creating custom barcode labels that can then be scanned by the LI-600 for sample information.

Impact Statements:

LI-6800 Portable Photosynthesis System: The Dynamic Assimilation Technique is based on a reformulation of the steady-state equation that enables you to measure assimilation curves. Dynamic assimilation data are comparable in uncertainty to traditional survey data. The increase in variability is typically offset by higher data density.

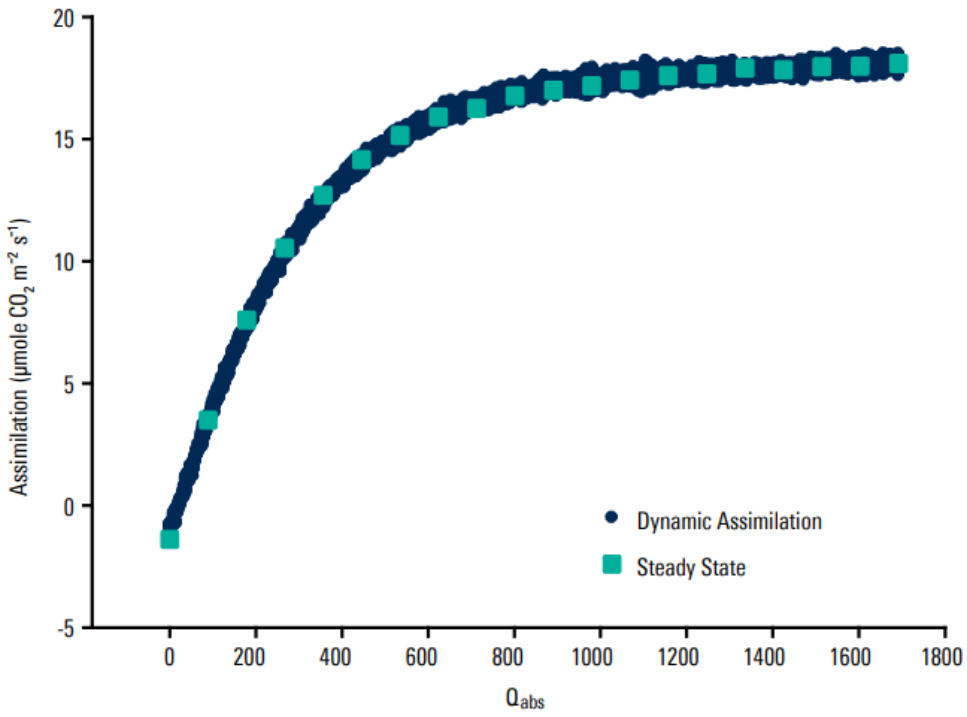


Figure 2: Comparison of dynamic and steady-state methods for an A-Q curve using soybean. For the dynamic method, actinic light was ramped from 2,000 µmol m-2 s-1 over 40 minutes. The steady-state method changed the actinic light level every 2 minutes.

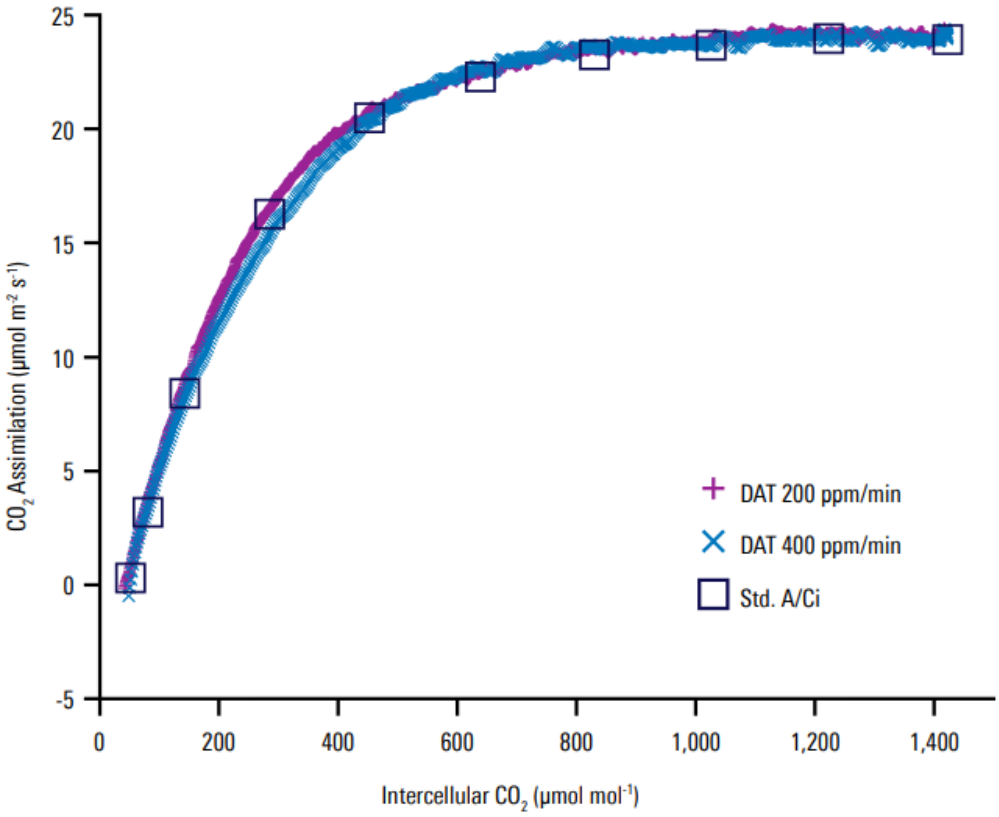
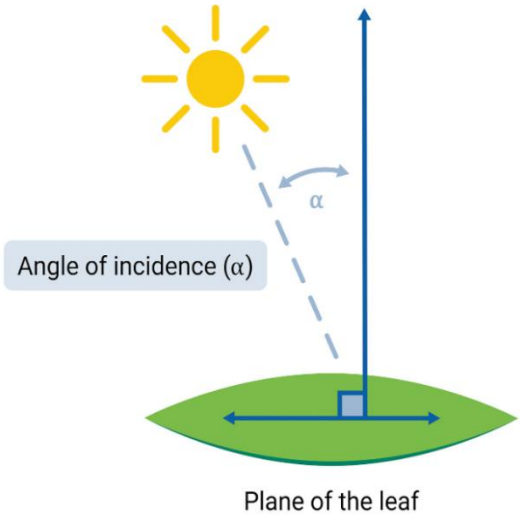


Figure 3: Soybean A-Ci curve comparing dynamic assimilation and steady-state measurements. The 400 ppm/minute curve was collected in 4 minutes and the 200 ppm/minute curve was collected in 8 minutes. In contrast, data for steady state curves may take up to 35 minutes to collect under ideal circumstances.

LI-600 Porometer/Fluorometer: Measuring the angle of incidence of a leaf is a useful variable for understanding a plant's architecture and its physiological responses to the environment. A leaf's angle of incidence may change, for example, to maximize light intensity for photosynthesis, minimize light intensity to conserve water, or allow light through a canopy to lower leaves. Knowing the angle of incidence of a leaf can lead to insights into how light intensity drives photosynthesis, and into the differences in measurements taken on the same plant.



Published Written Works:

LI-6800 Portable Photosynthesis System:

Saathoff, A. J., & Welles, J. (2021). Gas exchange measurements in the unsteady state. *Plant, Cell & Environment*, 44(11), 3509–3523. https://doi.org/10.1111/pce.14178

LI-600 Porometer/Fluorometer:

Hamerlynch, E.P., O'Connor, R.C. (2021). Photochemical performance of reproductive structures in Great Basin bunchgrasses in response to soil-water availability. *AoB PLANTS*, 14(1), plab076. https://doi.org/10.1093/aobpla/plab076

Saunders, A., & Drew, D.M. (2022) Stomatal responses of *Eucalyptus* spp. under drought can be predicted with a gain–risk optimization model. *Tree Physiology*, 42(4), 815-830. https://doi.org/10.1093/treephys/tpab145

Yousaf, M.J., F. Ali and F. Ali. 2022. Effect of sodium chloride stress on the adaptation of *Zea mays* seedlings at the expense of growth. *Sarhad Journal of Agriculture,* 38(1): 249-259. https://dx.doi.org/10.17582/journal.sja/2022/38.1.249.259