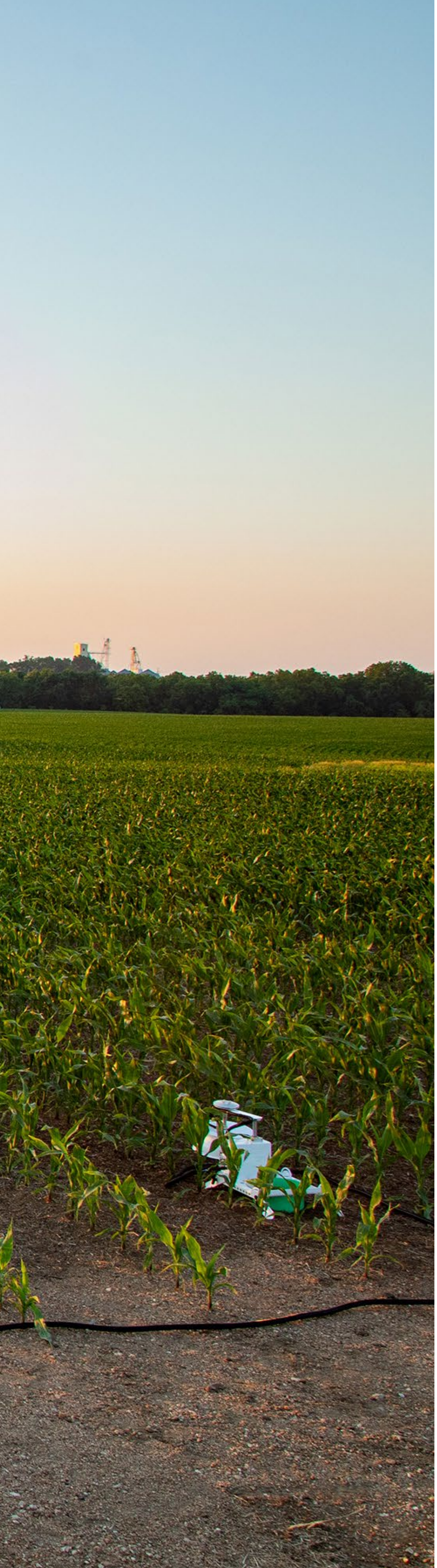
Soil Gas Flux Measurement Solutions

Complete systems guided by scientific principles from the ground up.

LI-COR®

Why measure soil gas flux?

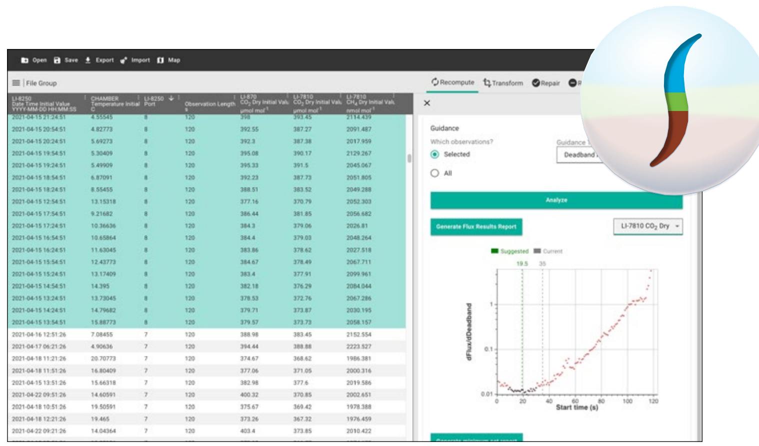
Soils produce and consume a substantial number of gases from the atmosphere through biological processes, including root respiration and organic matter decay. Gases—such as CO_2, CH_4, N_2O, and isotopologues—are continuously exchanged between the atmosphere and soil. Measuring soil gas flux can help researchers characterize greenhouse gas emissions, understand the mechanisms that regulate gas flux, and monitor carbon sequestration efforts, among other applications.



What makes LI-COR different?

In a typical chamber-based soil gas flux system, a chamber temporarily closes over the soil surface. Then a gas analyzer measures gas concentrations from the chamber air. In closed-chamber systems, fluxes are calculated using the rate of change in gas concentration over time and other parameters.

LI-COR is unique in that we design and manufacture complete systems for soil gas flux measurements. From patented hardware and analyzers that take the measurements, to SoilFluxPro™ Software that extends your flux data analysis capabilities—we have you covered.



LI-COR soil gas flux systems are modular and flexible to grow with your research. We offer gas analyzers that measure multiple key greenhouse gas species and have the portability and low-power requirements necessary for survey or long-term research. Chambers are available for both survey and long-term systems, with long-term systems allowing any combination of up to 36 LI-COR or custom-built long-term chambers.

Minimizing chamber influence through engineering

An inherent challenge to chamber design is the influence the chamber may have on measurements. LI-COR chambers include exclusive patented technology that minimizes soil disturbance and pressure perturbation while providing thorough air mixing.

Equalize chamber pressure

Any difference between the air pressure inside a soil chamber and ambient air will affect the flux rate. If the chamber is not properly vented, under windy conditions the Venturi effect can cause a mass flow of air from the soil into the chamber, leading to significant overestimation of soil gas flux.

To maintain pressure equilibrium, all LI-COR soil chambers feature a patented pressure vent.

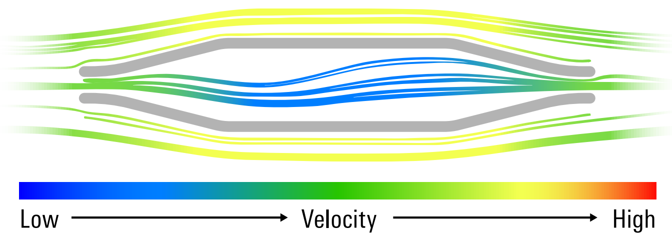


Figure 1. Cross section of the patented pressure vent used on all LI-COR chambers. As air is forced into the vent by wind, the average wind speed drops. As a result, most of the dynamic pressure is converted to static pressure, virtually eliminating the Venturi effect.[1] The patented vent (U.S. Patent 7,856,899) is radially symmetric to eliminate sensitivity to wind direction.[2]

Minimize soil disturbance

Any mechanical disturbance to the soil during a measurement can artificially influence gas fluxes. LI-COR chambers are placed over soil collars that are inserted before measuring. An automated mechanism seals the chamber around the collar. Because the chamber never touches the collar directly, any soil disturbance is negligible, and fluxes are minimally affected.

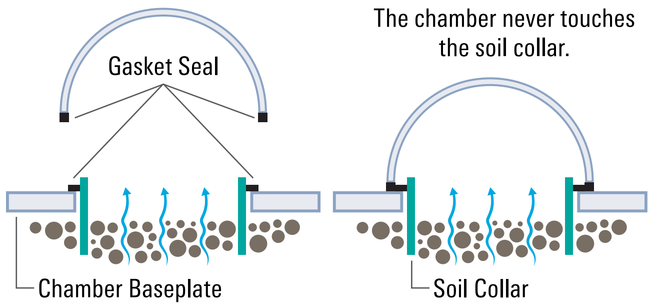


Figure 2. All LI-COR chambers feature a gasket seal around the soil collar with a second gasket on the chamber bowl to minimize disturbances to the soil collar when the chamber is placed or moved.

Optimize chamber air mixing

Air mixing is critical for accurate flux measurements, but fans create pressure gradients within the chamber that may suppress or enhance flux.

All LI-COR soil chambers are designed without fans, and mixing is achieved through a bowl-shaped chamber and air inlet/outlet positioning.

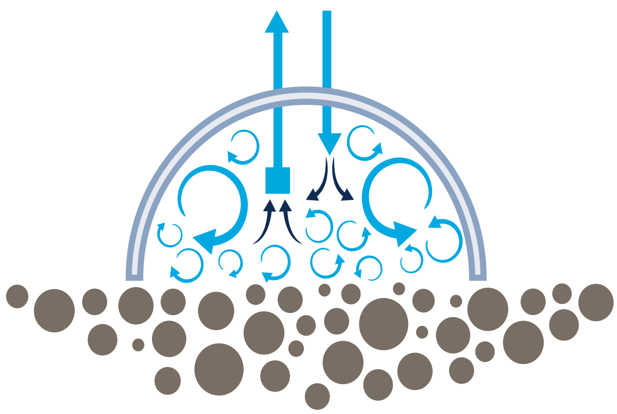


Figure 3. The shape of the chamber, along with air inlet and air outlet placement, ensures that the air within the chamber is well mixed.

Account for an altered diffusion gradient

When measuring gas concentration, you answer the question: "How much of a gas is at a location at a given moment?" When measuring gas flux, however, you answer the question: "How much of a gas is being emitted or absorbed from an area over a fixed period?"

Flux is determined from the rate at which gas concentrations change inside the chamber (Figure 4). However, once the chamber closes over a soil collar, gas concentrations increase and affect the gas diffusion gradient—suppressing the efflux. A linear regression often leads to flux underestimation. In some soils, such as porous soil, the underestimation can be significant.

The Smart Chamber, the LI-8250 Multiplexer, and SoilFluxPro™ Software all use an exponential function when computing fluxes to account for the impact of an altered diffusion gradient and to estimate flux at the time of chamber closing—when gas concentration is at ambient levels. Here we use CO_2 as an example to describe the exponential function:

$$C' = C'_s + [C'_0 - C'_s]e^{-\alpha t}$$

where C' is the instantaneous water vapor dilution-corrected chamber CO_2 mole fraction, C'_s is the water vapor dilution-corrected CO_2 concentration in the soil surface layer under the chamber, and α is a rate constant. With the initial slope (∂C'/∂t at t=0) of the function, the flux is estimated at the time of chamber closing, when C' is close to the ambient level (C'_0).

$$\frac{\partial C'}{\partial t} = \alpha[C'_s - C'_0]e^{-\alpha t}$$

Calculating the flux from the measured parameters is accomplished with:

$$F_c = \frac{VP_0(1 - W_0)}{RS(T_0 + 273.15)}\frac{\partial C'}{\partial t}$$

where F_c is the soil CO_2 flux, V is volume, P_0 is the initial pressure, W_0 is the initial water vapor mole fraction, S is soil surface area inside the chamber, T_0 is initial chamber air temperature, and ∂C'/∂t is the initial rate of change in water vapor dilution-corrected CO_2 mole fraction.

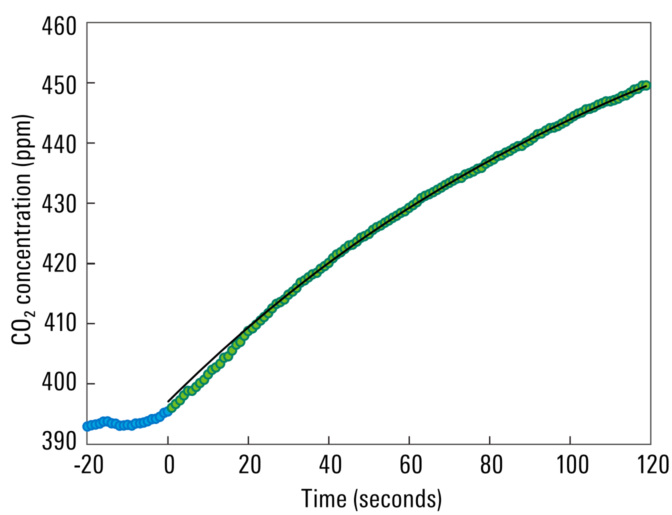


Figure 4. The CO_2 concentration in the chamber begins to increase the moment the chamber closes. As a result, the flux begins to decrease, indicated by the slope (∂C'/∂t) that decreases with time. Blue circles represent the pre-measurement CO_2 concentration; green circles represent the concentration during the measurement. An exponential fit can minimize the effect of an altered diffusion gradient.

References

1. Xu, L., Furtaw, M.D., Madsen, R.A., Garcia, R.L., Anderson, D.J., and McDermitt, D.K. (2006). On maintaining pressure equilibrium between a soil CO_2 flux chamber and ambient air. *Journal of Geophysical Research*, 111(D8). DOI: 10.1029/2005JD006435
2. Furtaw, M.D., McDermitt, D.K., and Xu, L. (2010). Vent and soil flux measurement system. U.S. Patent No. 7,856,899. Washington, DC: U.S. Patent and Trademark Office.

SoilFluxPro™ Software

Powerful and easy-to-use data management and optimization

SoilFluxPro streamlines the management of large datasets and includes post-processing tools to refine your soil gas flux results. It is developed exclusively for and included with LI-COR soil gas flux systems.

- Use advanced guidance tools for consistent deadband and stop time analysis.
- Perform quality assurance and quality control checks using revised parameters.
- Compute statistics and plot results for separate measurements or whole datasets.
- Map soil gas fluxes with GPS data and export .kml files for use with mapping services.
- Analyze fluxes from measurements made by third party analyzers.

New in SoilFluxPro Version 5.3

SoilFluxPro v5.3 includes powerful new advanced guidance tools for deadband and stop time analysis, the ability to save your favorite displays and link them to output, and more.

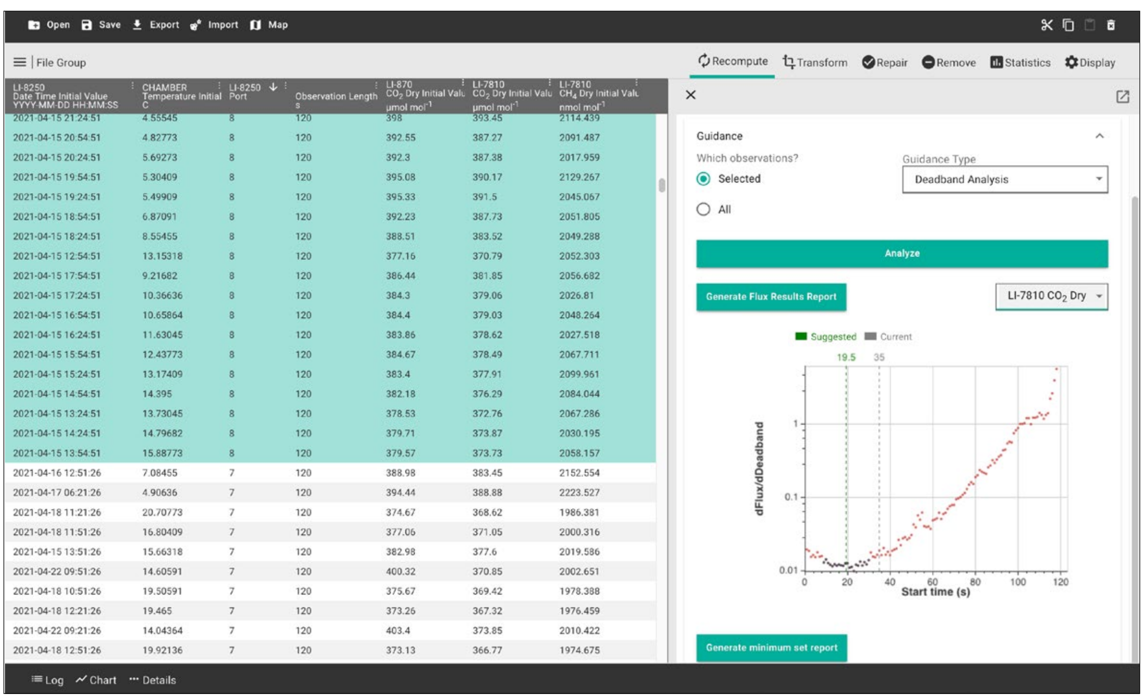


Figure 5. SoilFluxPro Deadband Analysis. The green line shows the suggested deadband (19.5 s), the gray shows the deadband currently in use (35 s). To make the calculation, the software used CO_2 concentration data from 372 observations from one port of an LI-8250 Multiplexer using an LI-7810 $CH_4/CO_2/H_2O$ Trace Gas Analyzer.

Fine-tune soil gas flux results

Compute fluxes and perform quality assurance checks for both long-term and survey datasets. SoilFluxPro™ allows you to revise the parameters of large datasets and instantly see the effect on your flux calculations. Recalculate multiple datasets at a time and use what you learn to optimize your measurements.

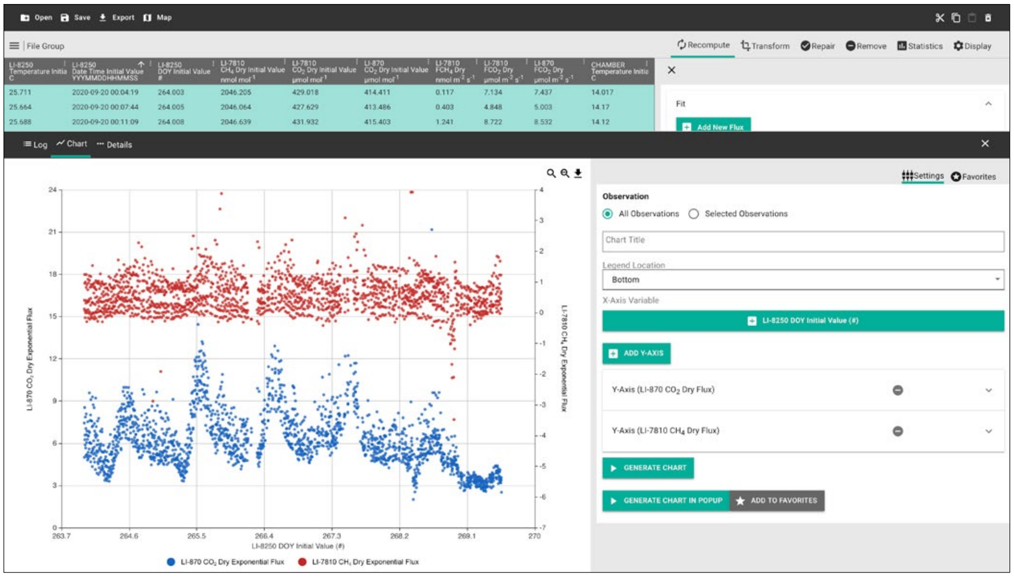


Figure 6. Graph fluxes, concentrations, and other variables to see changes over time or to compare with other variables. Shown are fluxes of CH_4 and CO_2 over time using data from an LI-7810 Trace Gas Analyzer and an LI-870 CO_2/H_2O Analyzer, respectively. Data were collected concurrently by the LI-8250 Multiplexer.

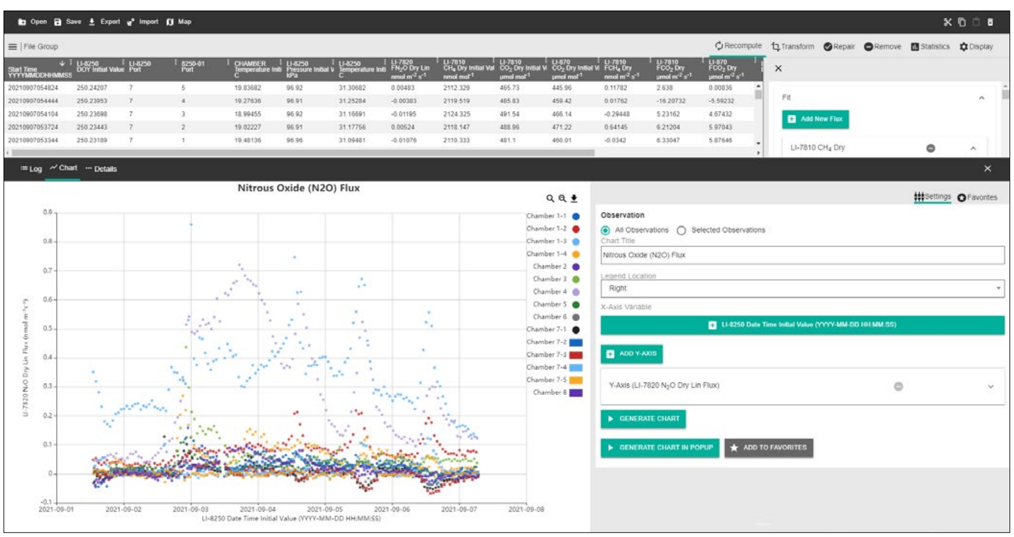
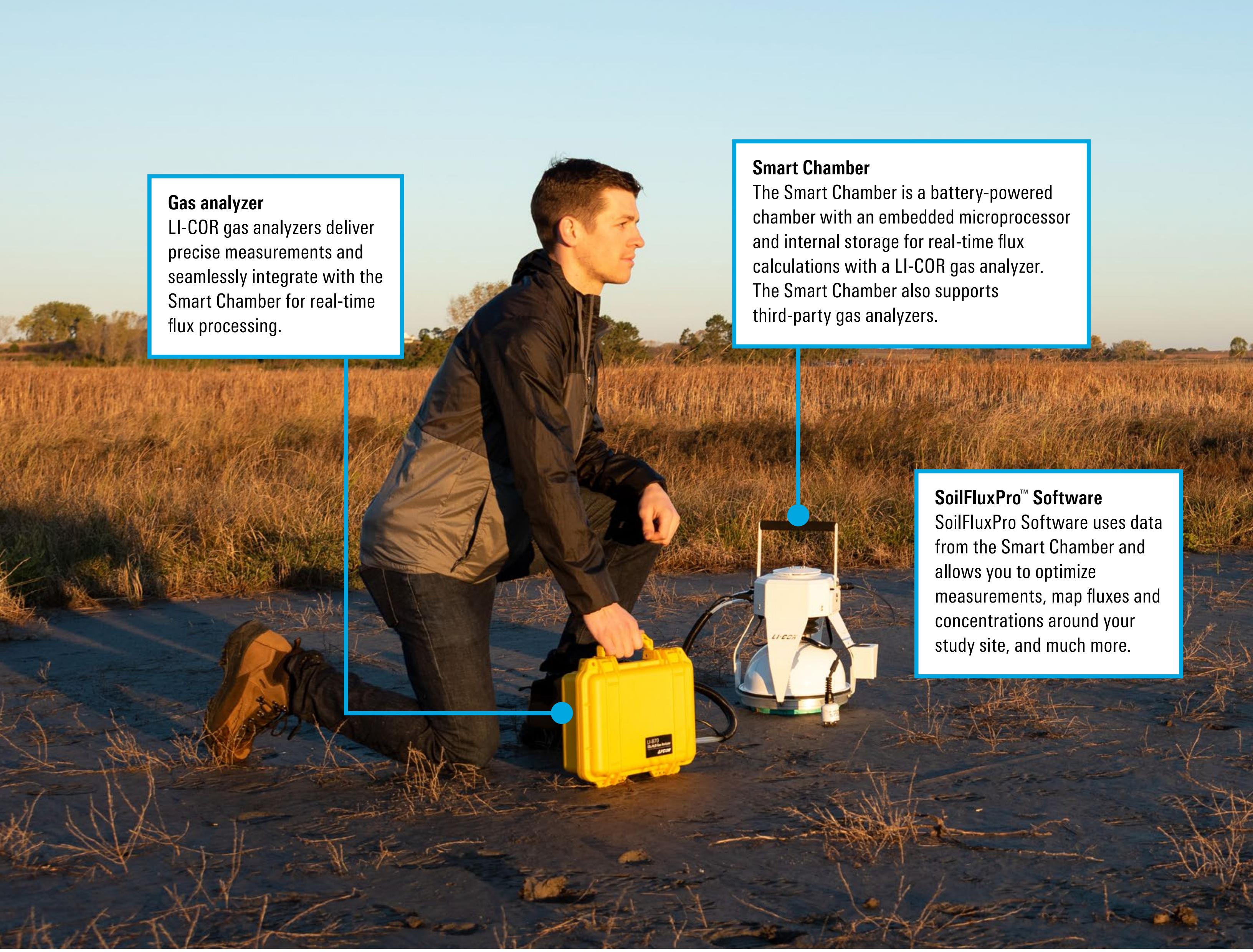


Figure 7. Group data by chamber to compare fluxes and see both spatial and temporal differences across a field site. Shown are soil gas fluxes of N_2O collected from 15 long-term chambers at a field site in Lincoln, Nebraska. Data were collected using the LI-8250 Multiplexer, two 8250-01 Extension Manifolds, and the LI-7820 N_2O/H_2O Trace Gas Analyzer.

Integrate complex datasets

The Smart Chamber and LI-8250 Multiplexer both integrate analyzers of various gas species, including third-party analyzers. SoilFluxPro carries that integration through post-processing. Compute fluxes of trace gases and isotopologues using complex datasets imported from LI-COR and third-party analyzers.



Survey systems: Assess spatial variability

LI-COR survey systems are portable and allow a researcher to quickly make soil gas flux measurements to characterize flux over a large area of interest. A survey system is uniquely suited to:

- Assess the spatial variability of soil gas flux over a large area
- Move quickly from one collar to the next to measure many points across your site
- Deploy in locations where instruments cannot be left long term

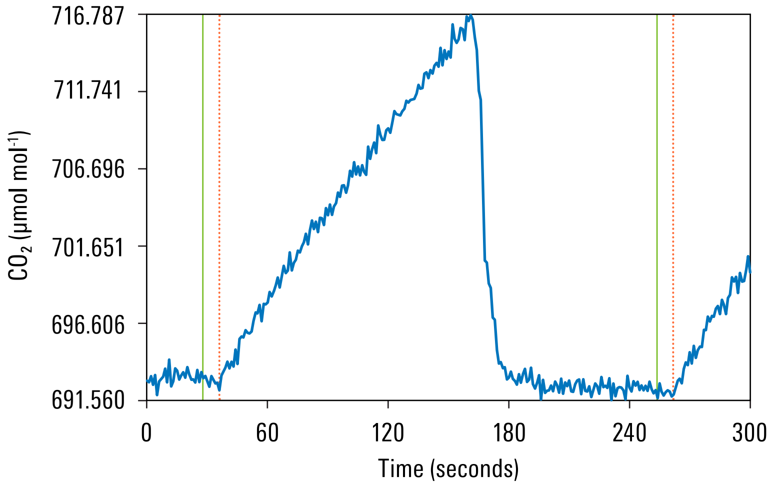
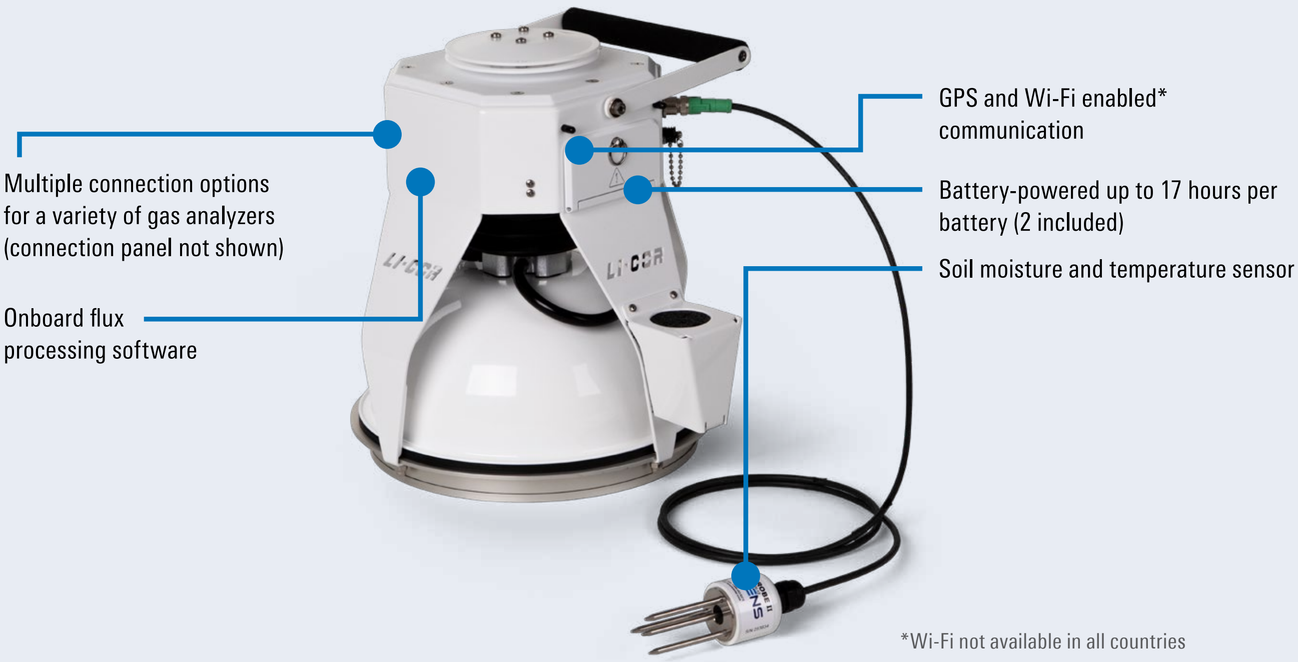


Figure 8. Monitor chamber closing (green line), deadband (red line), and CO_2 concentration changes. These variables are then used in flux calculations through the Smart Chamber's onboard software. Data shown are from an 8200-01S Smart Chamber with LI-870 CO_2/H_2O Analyzer.



Smart Chamber

The 8200-01S Smart Chamber is a portable and battery-powered chamber that features Wi-Fi connectivity and onboard flux processing with LI-COR gas analyzers. Connect, configure, and control the Smart Chamber using your mobile device or laptop via the embedded web server to see real-time flux data from multiple gas species.

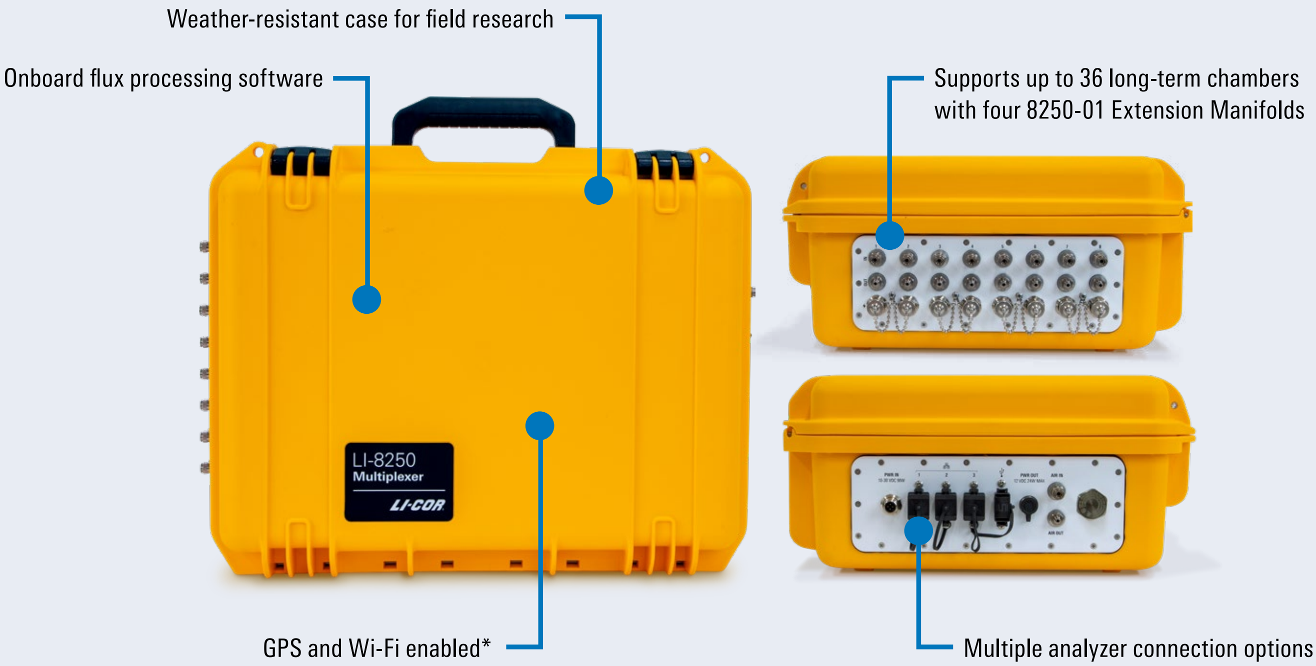
The Smart Chamber difference

- Includes the same patented technology unique to all LI-COR chambers
- Processes fluxes, integrated with auxiliary sensor, GPS, and time stamp data, in real-time with LI-COR gas analyzers
- View measurements, diagnostics, and data files from all LI-COR devices using an intuitive browser-based interface
- Collect third-party analyzer data concurrently with Smart Chamber data and merge them using SoilFluxPro™ Software
- Use the Trace Gas Sampling Kit to collect gas samples and log ancillary data with the Smart Chamber

Long-term systems: Evaluate spatial and temporal variability

A long-term system provides data useful for assessing both the spatial and temporal variability of soil gas flux. This is accomplished by making preconfigured, automated measurements over time using up to 36 chambers placed around your study site. This information is valuable to:

- Examine how events, such as rainfall, impact soil gas flux
- Evaluate how flux is regulated by environmental variables, such as soil temperature and soil moisture
- Characterize diurnal and seasonal flux patterns



*Wi-Fi not available in all countries

LI-8250 Multiplexer

The LI-8250 Multiplexer is the connection and control center of a long-term system directing the flow of gas between long-term chambers and gas analyzers. The LI-8250 processes fluxes on-site with a LI-COR gas analyzer, and you can see flux data live by connecting to the web server using Wi-Fi and your mobile device or laptop.

LI-8250 Multiplexer advantages

- View data, configure measurements, and interact with all connected LI-COR devices from a single point
- Make continuous automated measurements using any combination of up to 36 clear and opaque chambers
- Research even in harsh conditions with a rugged design
- Receive summary and raw data files to monitor your site from anywhere when connected to your site's cellular modem

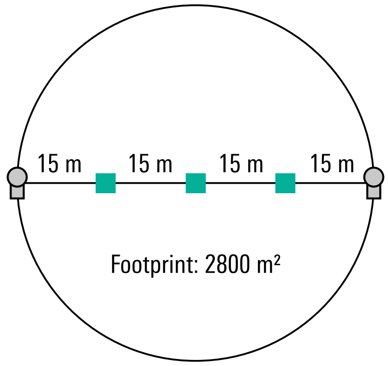
Interested in measuring trace gas evolution in flasks? The 8250-660 Flask Sampling Kit enables you to use your long-term system for flask measurements too.

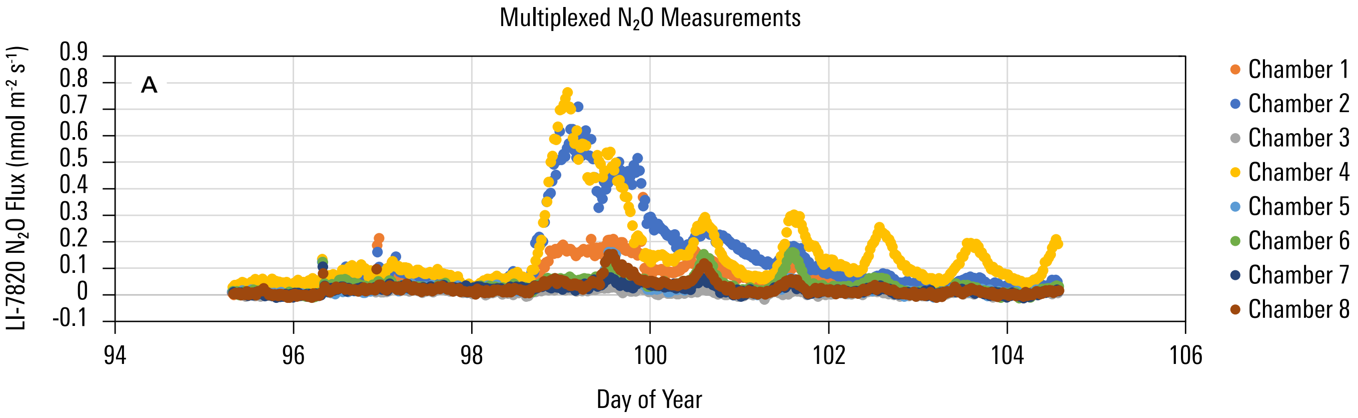
8250-01 Extension Manifold

The 8250-01 Extension Manifold expands your research site and opportunities. Each Extension Manifold occupies a single port on the LI-8250 Multiplexer, allowing 8 chambers to share the same port. A long-term soil gas flux system with 4 Extension Manifolds lets you collect data from up to 36 separate chambers in various conditions, enabling you to ask new research questions and to have more confidence in the answers.

8250-01 Extension Manifold advantages

- Powered, configured, and controlled using the LI-8250 Multiplexer
- Extends your research site to up to 36 chambers
- Grows your site footprint up to 2800 square meters
- Weather-resistant case for field research





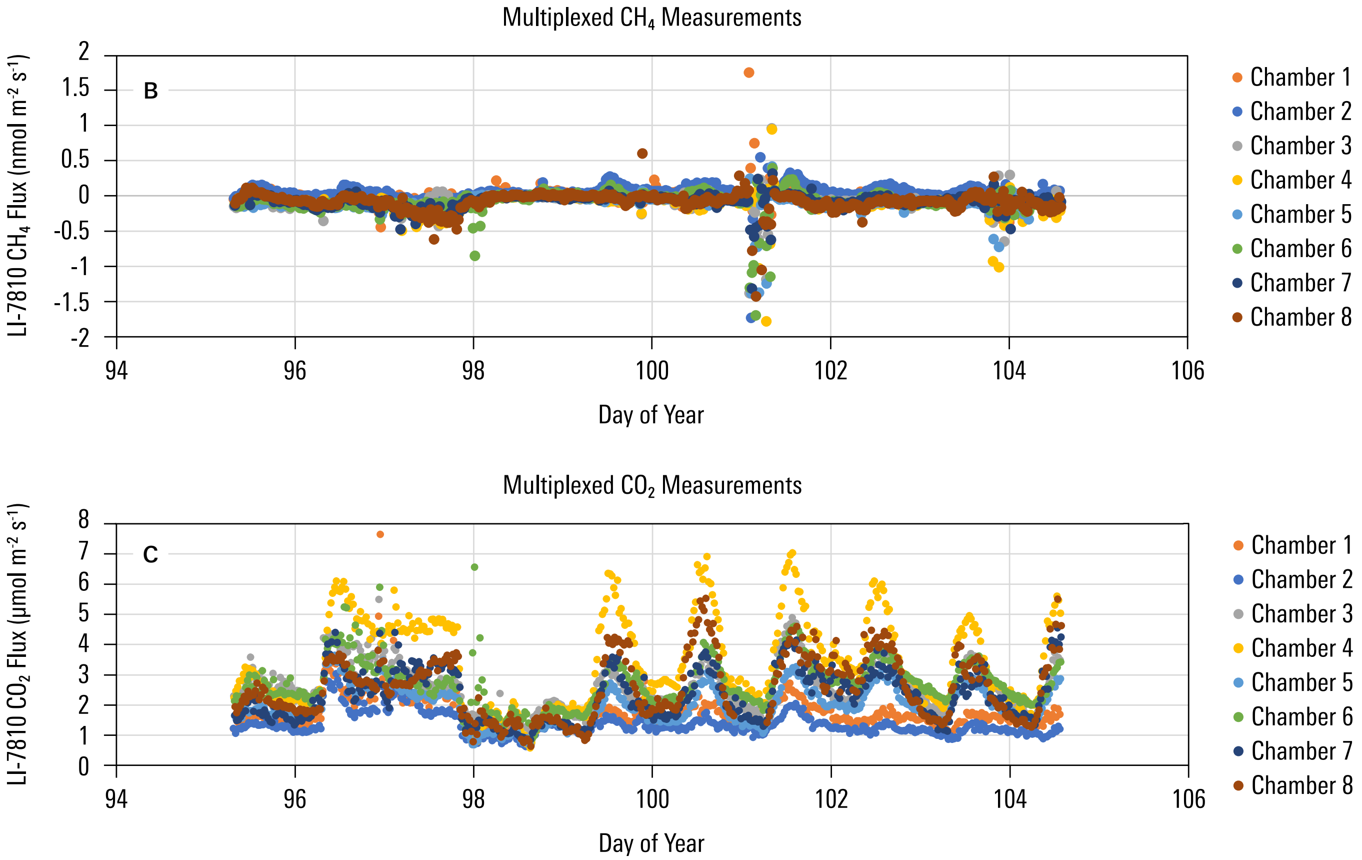


Figure 9. Measurements at a fescue lawn site in Lincoln, Nebraska demonstrate the temporal variability of soil gas fluxes. A diurnal pattern indicates positive N_2O and CO_2 fluxes were likely influenced by temperature. However, a sudden increase in CO_2 flux at around the 97th day of the year was likely caused by a rain event where the flux of CO_2 increased until soil saturation suppressed it. CH_4 flux was largely stable, with small negative flux due to oxidation. Fluxes shown were measured using the LI-7820 N_2O/H_2O and LI-7810 $CH_4/CO_2/H_2O$ Trace Gas Analyzers. Flux data was analyzed and charted using SoilFluxPro™ Software.

LI-COR long-term chambers

All LI-COR chambers include innovations to ensure the chambers have minimal impact on the soil environment and your measurements. Long-term chambers are intended to be left in the field for extended periods. Connect multiple SDI-12 sensors and light sensors to the chamber to collect ancillary data throughout your measurements.

- Patented vent design maintains ambient pressure in the chamber.
- Adjustable legs allow deployment on uneven surfaces and slopes.
- Chamber movement minimizes disturbance to soil gas concentrations.
- Clear chambers enable net carbon exchange measurements.

8200-104 Opaque Long-Term Chamber

The 8200-104 uses a reflective white enamel chamber that rotates to and from the soil collar for automated measurement of soil respiration.

8200-104C Clear Long-Term Chamber

The 8200-104C is specifically designed for net carbon exchange (NCE) research. A clear chamber allows plants within the collar to receive sunlight and continue photosynthesis during a measurement—helping you better understand the net carbon exchange within an ecosystem.

Custom chamber integration

If you have a chamber specifically designed for your application, the LI-8250 Multiplexer will allow you to integrate that chamber into a long-term soil gas flux system.

Gas analyzers

Choose a gas analyzer based on your gas of interest. LI-COR soil gas flux systems let you connect with a range of gas analyzers according to your research needs. When using LI-COR gas analyzers, you can automate measurements specific to your analyzer, see processed fluxes live from your mobile device or laptop, and examine key diagnostics for your measurement.

LI-870 CO_2/H_2O Analyzer

The LI-870 takes rapid and repeatable CO_2 and H_2O measurements for both survey and long-term systems.

- Powered directly by the 8200-01S Smart Chamber or LI-8250 Multiplexer
- Designed to be small and lightweight for a full day of survey measurements
- Features a user-serviceable optical bench in a durable, weather-resistant case

Trace Gas Analyzers

LI-COR Trace Gas Analyzers provide high performance with low power requirements and easily integrate into survey and long-term soil flux systems for an entirely comprehensive research solution.

- Utilize Optical Feedback-Cavity Enhanced Absorption Spectroscopy (OF-CEAS) and a suite of patented technologies
- Are powered by hot-swappable, long-lasting batteries or AC power
- Require minimal field enclosure for long-term deployment
- Are easily portable for survey measurements

LI-7810 CH_4/CO_2/H_2O Trace Gas Analyzer

The LI-7810 delivers high-precision CH_4 and CO_2 concentration measurements with benchtop precision and stability in a rugged, weather-resistant design.

LI-7820 N_2O/H_2O Trace Gas Analyzer

The LI-7820 offers high-precision N_2O measurements in a low power, reliable design that is built for field research.

Get a better look at the big picture

Redefine field research with the LI-8250 Multiplexer and 8250-01 Extension Manifold. Grow a long-term research site that includes dozens of chambers distributed over a 2800 square meter footprint—more than 1/4 of a hectare.

With a LI-COR survey or long-term system and a LI-COR gas analyzer, get fully processed fluxes at your site and watch how the soil responds to different conditions or treatments live.

Specifications

LI-8250 Multiplexer

General

Dimensions: 38.5 cm L × 52 cm W × 18.5 cm H
Weight: 7.7 kg
Weatherproof Rating: Tested to IEC IP55 standard
Operating Range:
  Temperature: -20 to 45 °C
  Humidity: 0 to 95% RH, non-condensing
User Data Storage: 8 GB total non-volatile
GPS: Accuracy 2.5 m CEP
Coverage Area:
  Maximum radius from LI-8250 to chambers: 15.0 m with one cable assembly or 30.0 m with an Extension Manifold and two cable assemblies.
  Maximum diameter of measurement circle: 30.0 m with two cable assemblies or 60.0 m with two Extension Manifolds and four cable assemblies.
Plumbing:
  Flow rate to/from chambers: ~2 to 3 lpm
  Pump type: Diaphragm (pumps in the analyzers subsample air stream in the LI-8250)
Barometric Pressure Sensor:
  Measurement Range: 20 to 110 kPa
  Sensor Accuracy: ±0.4 kPa from 50 to 110 kPa
  Resolution: 0.006 kPa

Communication

Seven LED Indicators: Power, Ready, Ethernet activity (3), USB activity (2)
Connectivity: Three Ethernet Ports, Wi-Fi (not available in some countries)
Wi-Fi Compatibility: 2.4 GHz, 802.11 a/b/g/n/ac
Connectivity Ports:
  USB-A: One sealed and strain-relieved for connection to LI-870 CO_2/H_2O Analyzer
  USB-A: Two standard, internal for USB mass storage (file transfer) or a country specific Wi-Fi adapter.
  RJ-45 Ethernet: Three sealed and strain-relieved for connection to LI-COR Trace Gas Analyzers, non-LI-COR analyzers, site Ethernet network, or cellular modem. Connectors also accept standard, non-sealed RJ-45 Ethernet cables for lab use.
Output Port Connector: Full-duplex RS-422 communication, 115,200 baud, plus 24 VDC power. Each output port is current-limited to ~1.8 A. Combined steady state power consumption for all chambers should not exceed 1 A.

Power

Power Requirements: 10 to 30 VDC (120 VAC and 240 VAC with optional power supply). The LI-8250 powers the 8200-104/C chambers, the 8250-01 Extension Manifold, and the LI-870 CO_2/H_2O Analyzer. Other analyzers are powered separately. See Table 1 for total system power requirements.

Table 1. Total system power requirements.

Typical Power Consumption (W)			
Instrument	**Idle**	**Sampling/ Moving**	**Max/ Warm-up**
LI-8250	4.8	15.6	18.2
8250-01 (each)	0.8	9.2	11.0
8200-104/C (each)	0.36	4.8	N/A
LI-870	5.0	5.0	14.0

Note: The max listed for the LI-8250 is a typical maximum, there is no additional warm-up power. Chamber power reaches 4.8 W only when opening or closing, not the entire time of sampling.

8250-01 Extension Manifold

General

Dimensions: 38.5 cm L × 52 cm W × 18.5 cm H
Weight: 7.4 kg
Weatherproof Rating: Tested to IEC IP55 standard
Operating Range:
  Temperature: -20 to 45 °C
  Humidity: 0 to 95% RH, non-condensing
Plumbing:
  Flow rate to/from chambers: ~2 to 3 lpm
  Pump type: Diaphragm

Communication

Two LED Indicators: Power, Ready
Input Port Connector: Full-duplex RS-422 communication, 115,200 baud, plus 24 VDC power.
Output Port Connector: Full-duplex RS-422 communication, 115,200 baud, plus 24 VDC power. Each output port is current-limited to ~1.1 A. Combined steady state power consumption for all chambers should not exceed 1 A.

Power

Power Requirements: Input voltage range is supplied by LI-8250 Multiplexer. Typical 24V and 1.8A max. See Table 1 for total system power requirements.
Alternate Power Input: 21.9 to 26.5 VDC 80 W

8200-104 Opaque and 8200-104C Clear Long-Term Chambers

General

Dimensions: 48.3 cm L × 38.1 cm W × 33.0 cm H
Weight: 7.3 kg
Chamber Volume: 3955 cm^3
Soil Area Exposed: 317.8 cm^2
Weatherproof Rating: Tested to IEC IP55 standard
Air Temperature Thermistor:
  Operating Range: -20 to 50 °C
  Accuracy: ±0.3 °C from -20 to 50 °C
Light Sensor Current Input:
  Range: 0 to 100 µA
  Resolution: 1.5 nA
  Accuracy: ±(0.37 % of Reading + 8 nA) from -20 to 50 °C
SDI-12 Communications Interface:
  Max Number of Devices: 10
Output Voltage: 12 VDC, 200 mA

8200-01S Smart Chamber

General

Bowl Diameter: 20 cm
Chamber Volume: 4244.1 cm^3
Soil Area: 317.8 cm^2
Weight (including battery): 4.3 kg
Memory: 8 GB total non-volatile (includes operating system and user data files)
GPS: Accuracy 2.5 m CEP
Operating Temperature Range: -20 to 50 °C
Air Temperature Thermistor:
  Operating Range: -20 to 70 °C
  Accuracy: ±0.5 °C over 0 to 70 °C
Barometric Pressure Sensor:
  Operating Range: 50 to 110 kPa
  Accuracy: ±0.4 kPa
  Resolution: 1.5 Pa Typical

Communication

Wi-Fi Compatibility: 2.4 GHz, 802.11 a/b/g/n/ac
SDI-12 Interface: Intended for connecting Stevens HydraProbe for soil moisture and temperature (included)
Connectivity Ports:
  USB-A: One sealed and strain-relieved for connection to LI-870 CO_2/H_2O Analyzer
  USB-B: One sealed and strain-relieved for connection to non-LI-COR gas analyzers
  RJ-45 Ethernet: One sealed and strain-relieved for connection to LI-COR Trace Gas Analyzers
  USB-A: One standard for connection to external Wi-Fi adapter
  Thermocouple Port: Intended for measuring soil temperature, using 9982-080 (not included, optional)
Cable Length:
  2 m (Ethernet, for LI-COR Trace Gas Analyzers)
  1.2 m (USB-B, LI-870 Power for LI-870 CO_2/H_2O Analyzer)

Power

Power Out: 10 to 17 VDC battery, unregulated, self-resetting fused, 2 A
Battery: 4S Li-Ion, 98 Wh, Smart-Battery with protection
Battery Life:
  34 hours use; 2 batteries, 17 hours per battery (2 minutes per collar active time, and 20 collars total per hour).
  20 hours use; 2 batteries, 10 hours per battery (above use case and including powering LI-870 CO_2/H_2O Analyzer).

LI-870 CO_2/H_2O Analyzer

General

Dimensions: 28.4 cm L × 27.9 cm W × 12.4 cm H
Weight: 2.31 kg
Operating Temperature Range:
-20 to 45 °C, without solar loading
Power Consumption:
After Warmup (without pump):
0.33 A @ 12 VDC (4.0 W) average
After Warmup (with pump):
0.42 A @ 12 VDC (5.0 W) average
Measurement Range:
CO_2: 0 to 20,000 ppm
H_2O: 0 to 60 mmol mol^{-1}
Measurement Accuracy:
CO_2: Within 1.5% of reading
H_2O: Better than 1.5% of reading

Trace Gas Analyzers

General

Measurement Technique: OF-CEAS (Optical Feedback-Cavity Enhanced Absorption Spectroscopy)
Measurement Rate: 1 sample per second (1 Hz)
Optical Cavity Volume: 6.41 cm^3
Flow Rate: 250 sccm nominally; 70 sccm with reduced flow rate kit
Total Weight: 10.5 kg (including batteries)
Case Dimensions: 51 cm x 33 cm x 18 cm (L x W x H)
Operating Temperature Range: -25 to 45 °C (without solar load, under normal operating conditions)
Operating Humidity Range: 0 to 85% RH (non-condensing, without solar load, under normal operating conditions)
Sample Line Humidity Range: 0 to 99.9% non-condensing
Operating Pressure Range: 70 to 110 kPa
Connectivity: Ethernet, Wi-Fi (not available in some countries)
Wi-Fi Compatibility: 2.4 GHz, 802.11 a/b/g/n/ac
Power Consumption:
Steady State Operation: 22 Watts at 25 °C without batteries charging
Warmup: Up to 65 W without batteries charging; up to 100 W with batteries charging
Off: Up to 2.3 W when powered from pins 3 and 4 without batteries charging; up to 0.2 W when powered from pins 1 and 5 without batteries charging
Power Supply Requirements:
Pins 1 and 5 (24 VDC Input): Minimum 6 A at 24 V
Pins 3 and 4 (10.5 to 33 VC Input): Minimum 14 A at 10.5 VDC; 6 A at 24 VDC
Power Supply: Universal Power Adapter (Input: 100 to 240 VAC, 50-60 Hz; Output: 24 VDC)
Battery Life: 8 hours typical with 2 batteries
Pollution Degree: 2
Over-voltage Category: II
Class 1 Laser Product

Specifications subject to change without notice.

LI-7810 CH_4/CO_2/H_2O Trace Gas Analyzer

CH_4 Measurements
Response Time (T_{10}-T_{90}): ≤ 2 seconds from 0 to 2 ppm
Range: 0 to 100 ppm
Precision (1σ):
0.60 ppb at 2 ppm with 1 second averaging
0.25 ppb at 2 ppm with 5 second averaging
Maximum Drift: < 1 ppb per 24-hour period
CO_2 Measurements
Range: 0 to 10,000 ppm
Precision (1σ):
3.5 ppm at 400 ppm with 1 second averaging
1.5 ppm at 400 ppm with 5 second averaging
H_2O Measurements
Range: 0 to 60,000 ppm
Precision (1σ):
45 ppm at 10,000 ppm with 1 second averaging
20 ppm at 10,000 ppm with 5 second averaging

LI-7820 N_2O/H_2O Trace Gas Analyzer

N_2O Measurements
Response Time (T_{10}-T_{90}): ≤ 2 seconds from 0 to 330 ppb
Range: 0 to 100 ppm
Precision (1σ):
0.40 ppb at 330 ppb with 1 second averaging
0.20 ppb at 330 ppb with 5 second averaging
Maximum Drift: < 1 ppb per 24-hour period
H_2O Measurements
Range: 0 to 60,000 ppm
Precision (1σ):
45 ppm at 10,000 ppm with 1 second averaging
20 ppm at 10,000 ppm with 5 second averaging

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