LI-8100A Automated Soil Gas Flux System

A Rugged System for Dependable Results


LONG TERM CHAMBER
LI-COR

Designed with flux in mind

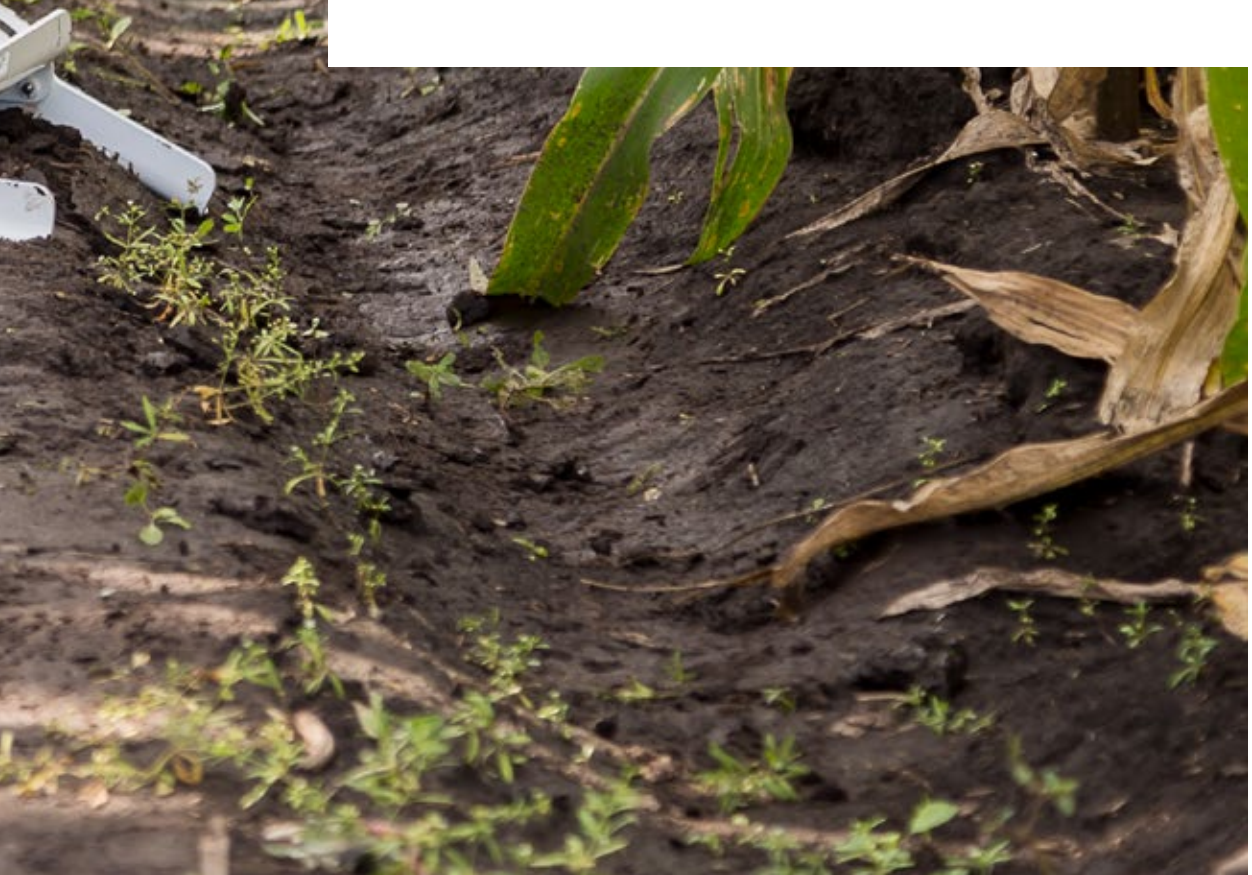
The LI-8100A measures CO_2 flux from soils. A modular system, you can use the LI-8100A to rapidly survey emissions from numerous locations in a study site or to conduct continuous long-term measurements with up to 16 chambers. With a compatible trace gas analyzer you can measure the flux of nearly any gas, including N_2O, CH_4, CO, and isotopic species.

Chambers that make the measurement worthwhile

Developed with extensive research and testing, the LI-8100A chambers feature numerous innovations to ensure that the chambers themselves do not confound your measurements. These innovations ensure that the presence of the soil collar and chamber baseplate, as well as the closing action of the chamber bowl, minimally affect the soil environment.

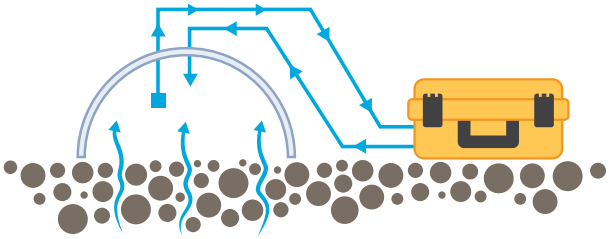
The ultimate in data processing simplicity

Allowing you to adjust critical parameters to quickly get the best results, SoilFluxPro™ Software is a free application that provides powerful tools to recompute results and evaluate datasets from the LI-8100A and compatible trace gas analyzers.



Why measure gas exchange from soils?

Soils contain substantial amounts of carbon, which is continuously exchanged with the atmosphere as it is converted to CO_2 by microbes and replenished through photosynthetic assimilation. Other gases, such as N_2O, CH_4, CO, and gases containing isotopic atoms, are emitted from or taken up by soils as well.



How is soil gas exchange measured?

Closed chamber-based soil gas exchange systems typically consist of one or more chambers that temporarily close over the soil surface, and a gas analyzer that measures gas concentrations from the closed chamber. Software computes flux results from the rate of change in gas concentration over time and other parameters.

Concentrate on the flux

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

Flux is determined from the rate at which gas concentrations change inside the chamber (Figure 1).

The LI-8100A and SoilFluxPro™ Software both use an exponential function to compute the flux:

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

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 ($\partial C'/\partial t$ 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 air temperature, and $\partial C'/\partial t$ is the initial rate of change in water vapor dilution-corrected CO_2 mole fraction.

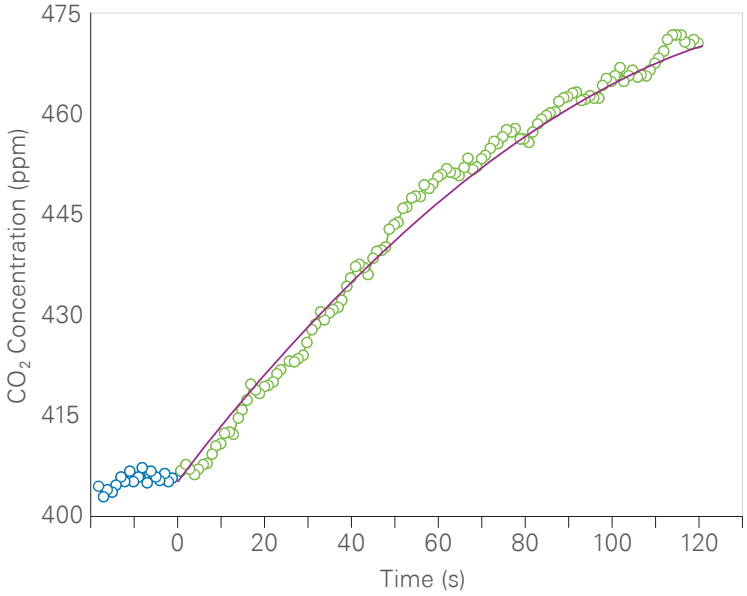


Figure 1. The CO_2 concentration in the chamber begins to increase the moment the chamber closes. As a result, the flux begins to decrease, indicated by the slope ($\partial C'/\partial t$) that decreases with time. Blue circles represent the pre-measurement CO_2 concentration; green circles represent the concentration during the measurement.

Soil gas flux chambers: Simple in form. Complex in function.

The importance of soil gas flux chambers to accurate measurements is often underestimated. LI-8100A chambers are designed based upon extensive research and testing, which resulted in patented technology that is exclusive to LI-COR chambers.

LI-8100A chambers include features that mitigate the adverse effects of chamber placement on the soil. These include disturbance that occurs when the chamber closes, poorly mixed air in the chamber, and air pressure-induced emissions that result from windy conditions during measurements.

Mixing air in the chamber

During a measurement, air in the chamber must be well mixed because only a small portion of the air from the chamber is pumped into the gas analyzer for gas concentration measurement. The LI-8100A chambers mix the sample air with a combination of the hemispherical chamber shape and the positions of the air inlet and outlet (Figure 2). The system does not use a mixing fan, which prevents artificial chamber pressure perturbations (Hanson, et al., 1993).

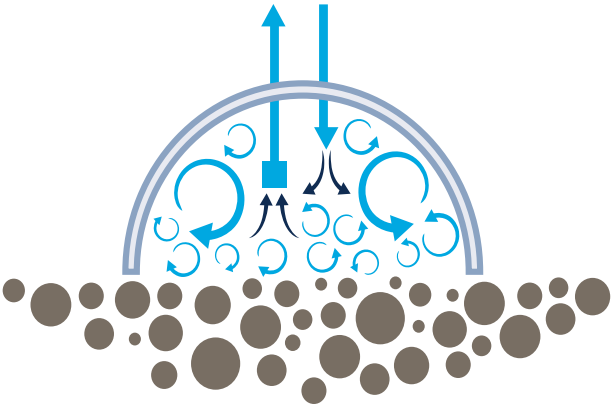


Figure 2. The shape of the chamber helps ensure that sample air is well mixed.

Hanson, P.J., S.D. Wullschluger, S.A. Bohlman, and D.E. Todd. 1993. Seasonal and topographic patterns of forest floor CO_2 efflux from an upland oak forest. Tree Physiology. 13:1-15.

Maintaining ambient pressure in the chamber

Soil CO_2 flux is driven by both diffusion and mass flow, with diffusion controlled by the CO_2 concentration gradient, and mass flow by pressure fluctuations at the soil surface. Chambers need to be vented to ambient air to ensure that the pressure inside the chamber is equal to ambient pressure during a measurement. When wind gusts over a traditional vent, pressure in the chamber drops due to the Venturi effect. This causes a mass flow of CO_2-rich air from the soil into the chamber, leading to a significant overestimation of the flux (Bain et al., 2005; Xu et al., 2006).

LI-8100A chambers feature a patented pressure vent that maintains ambient pressure inside the chamber, under both calm and windy conditions. This patented feature, exclusive to LI-COR chambers, ensures that the measured flux is representative of the flux that occurred outside the chamber under natural conditions. The vent is radially symmetrical, which eliminates sensitivity to wind direction.

Bain, W.G., L. Hutyra, D.C. Patterson, A.V. Bright, B.C. Daube, J.W. Munger, S.C.Wofsy. 2005. Wind-induced error in the measurement of soil respiration using closed dynamic chambers. Agricultural and Forest Meteorology. 131:225-232.

Xu, L., M.D,. Furtaw, R.A. Madsen, R.L. Garcia, D.J. Anderson, and D.K. McDermitt. 2006. On maintaining pressure equilibrium between a soil CO_2 flux chamber and the ambient air. Journal of Geophysical Research. 111. doi:10.1029/2005JD006435.

Minimizing disturbance to the soil

An automated closure mechanism gently lowers the chamber onto the soil collar. Two gaskets—one between the chamber bowl and baseplate, and another between the baseplate and the soil collar—ensure that the chamber does not contact the soil collar directly, and that the collar does not move when the chamber closes. Gently lowering the chamber also prevents the possibility of pushing fresh air into the soil as the chamber closes. This feature prevents the closing chamber from altering the diffusion gradient prior to each measurement.

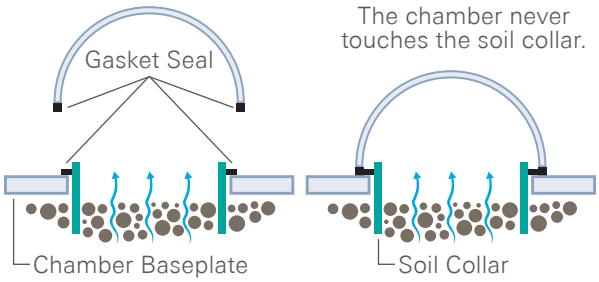


Figure 3. Each chamber features a gasket seal around the soil collar and a second gasket on the chamber bowl.

Long-term chambers feature a perforated baseplate that helps minimize perturbations from natural conditions near each measurement location.

Accounting for the altered diffusion gradient

CO_2 begins to accumulate in the chamber once the chamber closes. This decreases the CO_2 diffusion gradient, and consequently the flux begins to decrease. To account for this, the LI-8100A uses an exponential function to determine the initial slope and compute the flux at the moment the chamber closed. This ensures that your results represent the flux under ambient conditions and provides a more accurate measurement.

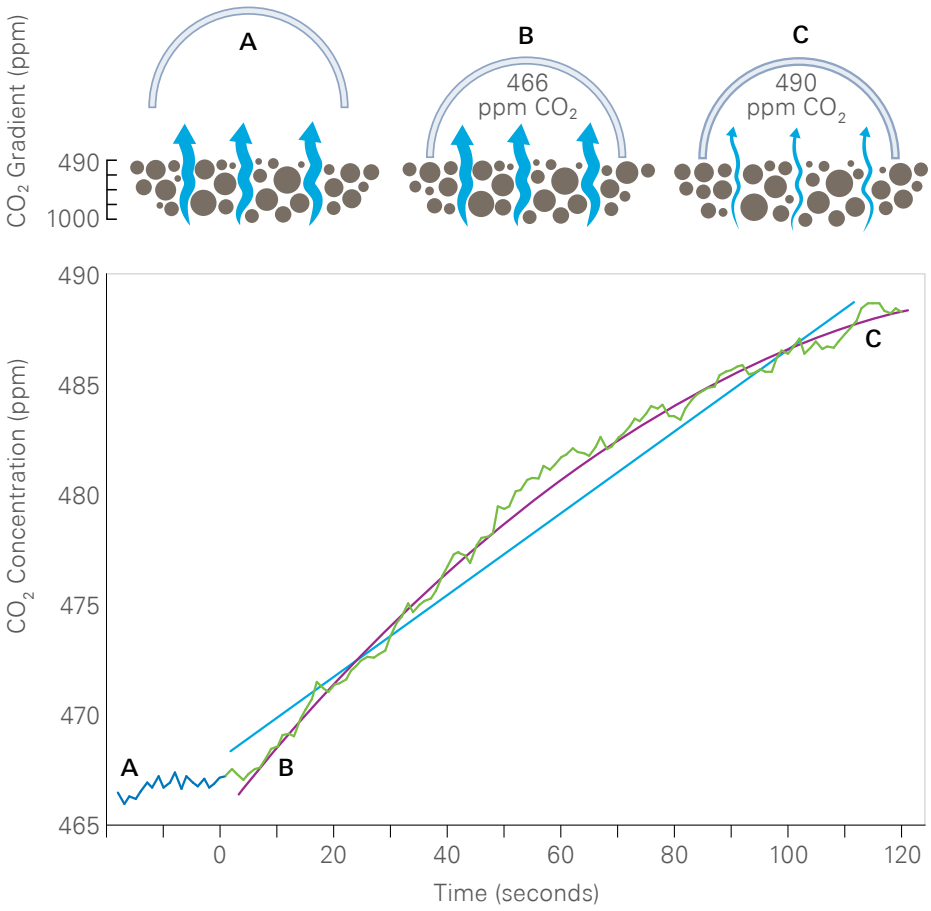


Figure 4. The baseline concentration (A), beginning of the measurement (B), and end of a measurement (C). The LI-8100A and SoilFluxPro™ Software compute the flux from the slope at point B. The red line is the exponential fit, while the blue line is the linear fit.

LI-8100A Analyzer Control Unit

Housed in a splash-resistant enclosure, the Analyzer Control Unit consists of a gas analyzer, the system controller, and a memory card to store data.

- Dust and splash resistant, with weather resistant cable connectors.
- Measures CO_2 concentrations from 0 to 20,000 ppm.
- With networking capabilities, you can put the system online to review performance and download data remotely.
- Portable and designed for long-term deployment, so you can take it into the field and leave it exposed to the elements for extended field seasons.
- Light and easy to carry during survey measurements.
- Battery powered for portability.

LI-8150 Multiplexer: Understand spatial and temporal variability

Soils exhibit highly variable fluxes due to their heterogeneous nature. In addition, fluxes vary considerably over the course of a day, and even more over the course of a season. A large sample size and long-term measurements help you characterize the flux much better than a single measurement.

The LI-8150 Multiplexer enables you to collect a large sample size and characterize gas exchange for a study area or from treatment and control groups. It connects up to 16 chambers—with any combination of opaque or clear chambers. You can also configure the Multiplexer for other applications, including flask measurements and atmospheric CO_2 profile sampling.

Measure trace gas flux with the LI-8100A

The LI-8100A supports trace gas flux measurements using a number of techniques. You can use the optional Trace Gas Sampling Kit as a simple, low cost solution. Alternatively, you can use an external trace gas analyzer to log datasets for more comprehensive analysis in SoilFluxPro™ Software.

Integrate an external trace gas analyzer with the LI-8100A system

Combine the proven LI-8100A chambers and an external trace gas analyzer to create datasets that are easy to analyze with SoilFluxPro™ Software. In this configuration, you can take advantage of the sophisticated LI-8100A chambers and advanced data processing capabilities of SoilFluxPro Software to compute fluxes of trace gas species. This arrangement can be used in both single-chamber and multiplexed configurations.

Trace Gas Sampling Kit

The Trace Gas Sampling Kit is a simple add-on to the LI-8100A system. It can be used with the single-chamber or multiplexed configurations to collect subsamples from the sample tubes. By analyzing the gas concentrations of the subsamples using a gas chromatograph or mass spectrometer in the laboratory, you can compute the flux of numerous trace gas species.

This allows you to take advantage of the sophisticated LI-8100A chambers when measuring flux of N_2O, CH_4, or isotopic species, without the need to install a laboratory gas analyzer in a field setting.

Chamber control kit: Build your own trace gas flux system with LI-8100A chambers

If you're technically inclined and wish to develop your own datalogger, system controller, and data processing software, the chamber control kit provides all the hardware you need to control the LI-8100A chambers with a Campbell® Scientific datalogger, Arduino electronics platform, or other TTL-compatible device, while using an external gas analyzer to measure gas concentrations.

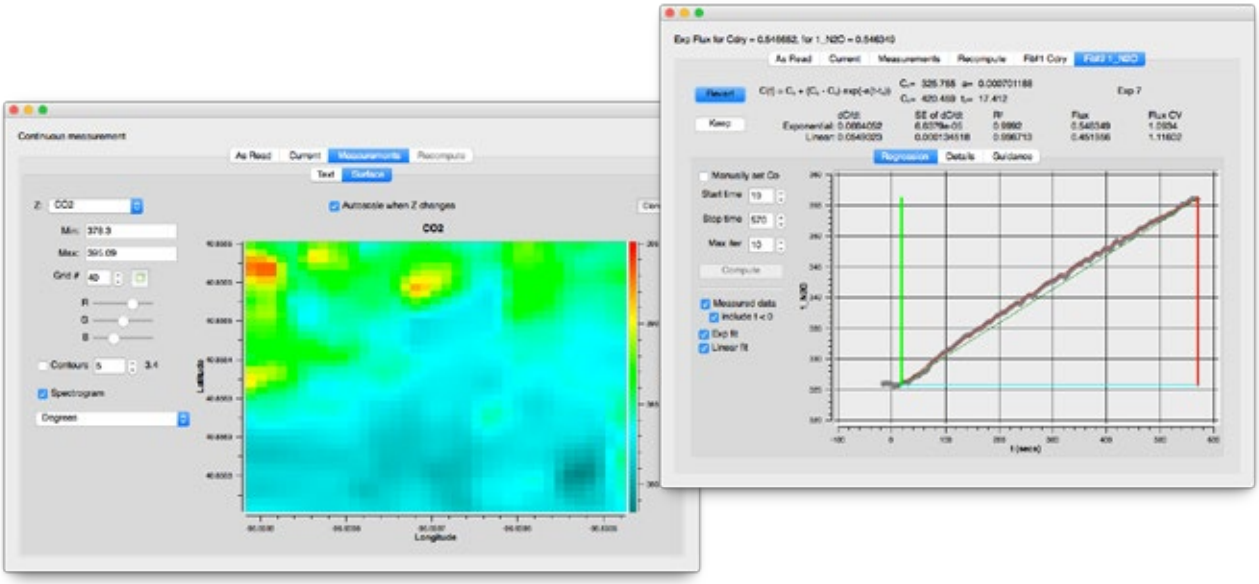
This arrangement combines the careful design of LI-8100A chambers and the measurements from an external trace gas analyzer to create a versatile system for soil gas flux measurements. The chamber control kit includes soil temperature and moisture sensors. In this configuration, you'll have to program the controller, log the data, and process the datasets.

Contact us to learn more about soil gas flux measurements that combine the LI-8100A with trace gas analyzers.

SoilFluxPro Software: Simply powerful software

SoilFluxPro™ Software is free software that you use to process and evaluate data from the LI-8100A. Developed by leading soil scientists and software engineers, SoilFluxPro provides flexibility to ensure that your flux measurements are computed accurately.

- Easily recompute data with altered parameters, such as deadband duration and measurement length, to ensure the correct results.
- Quickly plot results and statistics to evaluate measurements individually or in groups.
- Compute statistics for individual measurements or whole datasets.
- Create .kml files to map concentrations and fluxes on the Google Earth™ mapping service.
- Compute flux from measurements made by other trace gas analyzers.
- Compatible with both Windows® and Mac® operating systems.



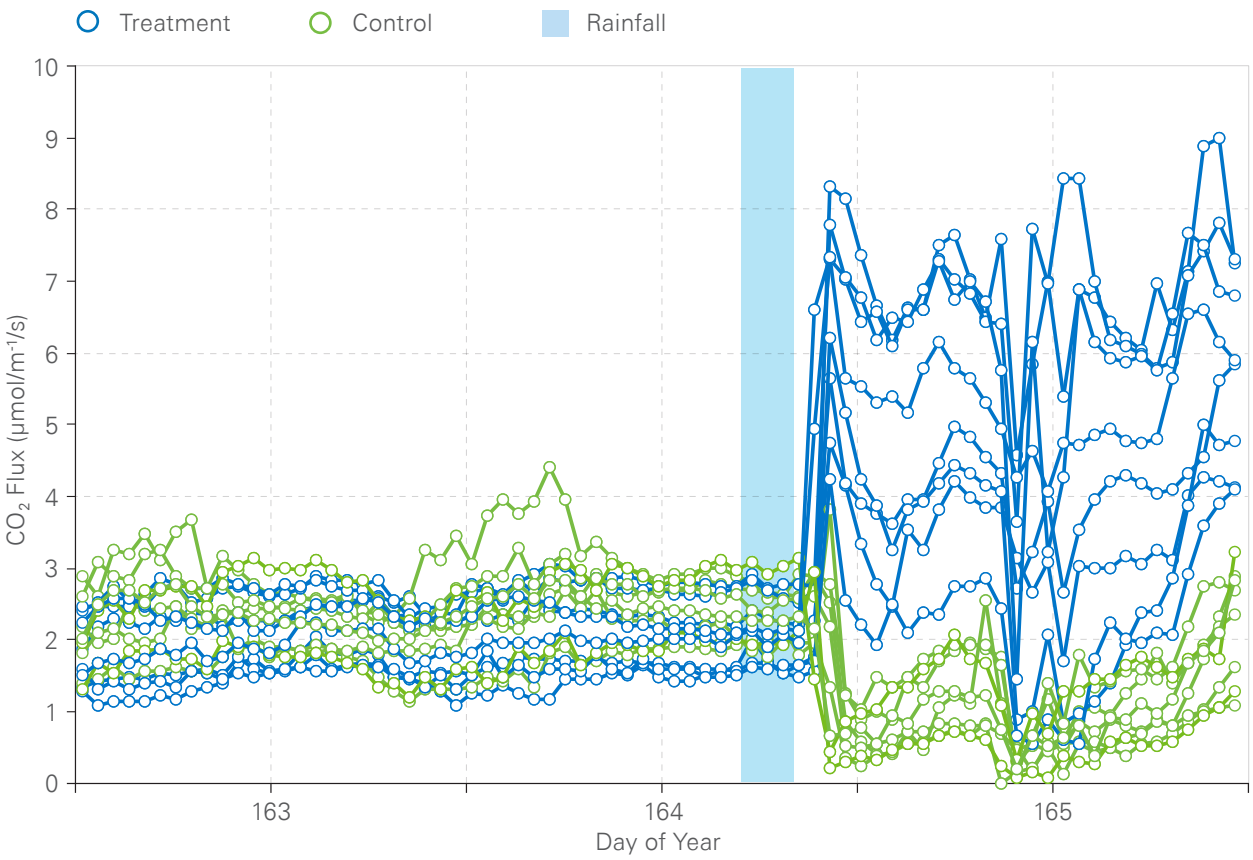


Figure 5. Soil CO_2 flux measurements collected with a 16-chamber system over a cornfield. Treatment plots had crop residue on the soil surface and control plots had no residue. The vertical blue bar represents a 29-mm rain event. Data indicate that for this particular research site, the response of soil CO_2 flux to a rainfall event depends on whether there is crop residue at the soil surface or not.

The LI-8100A mobile app gives you the freedom to control the instrument from iOS and Android devices. You can configure the instrument, activate measurements, and monitor data as measurements progress, with the convenience of your favorite mobile device.

Survey measurements: Evaluate spatial variability

Survey measurements characterize CO_2 flux from many locations over an area of interest. Survey measurements can be combined with the CO_2 Mapping Kit to help visualize spatial variation in soil CO_2 flux.

- Quickly measure many points over a research site
- Ideal for assessing spatial variability of soil CO_2 flux
- 20 cm chamber provides measurements over a large surface area
- 10 cm chamber is ideal for small areas and irregular soils that will not accommodate a larger chamber

Long-term measurements: Evaluate temporal variation of the flux

With a single chamber long-term configuration, you can make continuous automated flux measurements at one location over time.

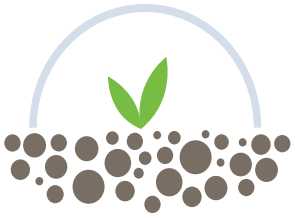
- Ideal for assessing the temporal variation of the flux for weeks or months at a time
- Compatible with both clear and opaque chambers


LI-COR

Multiplexed measurements: Characterize spatial and temporal variability

With support for as many as 16 chambers, the multiplexed configuration gives you a large sample size to characterize long-term gas flux at 16 locations. It provides continuous long-term measurements, which characterize diurnal and seasonal patterns.

- Supports any combination of clear and opaque chambers
- Ideal for assessing both spatial and temporal variability of soil gas flux



Net carbon exchange measurements

With the 8100-104C Clear Chamber, you can measure net carbon exchange (NCE), which is a key variable for understanding the carbon balance of an ecosystem. NCE is the gross primary production minus the ecosystem respiration. The clear chamber enables vegetation under the chamber to continue photosynthesis during a measurement. LI-8100-NCE packages are available in both single-chamber and multi-chamber configurations.

Gas concentration and flux mapping

The optional CO_2 Mapping Kit adds GPS capabilities to the LI-8100A, making it easy to record ground-level CO_2 concentrations and map your dataset in Google Earth™. You can map survey measurements of CO_2 fluxes or log continuous datasets while walking or driving to assess ground-level CO_2 concentrations.

Flask gas exchange measurements

The optional Flask Sampling Kit enables you to measure CO_2 exchange from discrete samples contained in flasks. The Multiplexer controls air flow and sampling from each flask and records data according to your settings. The kit is also suitable for recording and measuring other trace gases with an external gas analyzer.

Gas profiling

The LI-8100A and LI-8150 Multiplexer combination can be used to do atmospheric CO_2 profiling with the Profiling Kit. The system can record up to 16 points in either horizontal or vertical gas profiles. It is compatible with many external trace gas analyzers to measure profiles of N_2O, CH_4, and other gas concentrations. In this configuration, the system controls sampling of each inlet and records data according to your settings.

Specifications

Analyzer Control Unit

Power Requirements: 10.5 VDC to 28 VDC; 3 A @ 12 V (36 W) maximum during warm-up; 1 A @ 12 V (12 W) average

Operating Temperature Range: -20 °C to 45 °C

Relative Humidity Range: 0% to 95% RH, Non-Condensing

Weatherproof Rating: Tested to IEC IP55 standard

Dimensions: 29 cm L × 38.1 cm W × 16.5 cm H

Weight: 5.3 kg without battery; 6.7 kg with battery

Battery Weight: 1.4 kg

Memory: 18 MB flash memory for data collection (32 MB total)

Compact Flash Card: Type I industrial grade, 1 GB with adapter sleeve included, will accept Type II with appropriate adapter sleeve

Wireless PC Card: Fixed wireless networking Type II PC Card. Cisco Systems Aironet® 350 Series 11 Mbps DSSS for Wi-Fi (802.11b) networking

RS-232 Maximum Output Rate: 1 Hz

RS-232 Baud Rate: 57,600 bps

Pressure Sensor Range: 15 kPa to 115 kPa

Pressure Sensor Accuracy: 1.5% over 0 °C to 85 °C

Maximum Gas Flow Rate: ~2.0 lpm

Infrared Gas Analyzer

- **Measurement Principle:** Non-Dispersive Infrared
- **Traceability:** Traceable to WMO standards for CO_2. NIST traceable LI-610 Portable Dew Point Generator for H_2O

CO_2 Measurement

Measurement Range: 0 ppm to 20,000 µmol mol^{-1}

Accuracy: 1.5% of reading

Drift at 0 ppm: <0.15 ppm per °C

Span Drift†: <0.03% per °C

Total Drift at 370 ppm: <0.4 ppm per °C

RMS Noise at 370 µmol mol^{-1} with 1 sec signal averaging: <1 µmol mol^{-1}

Sensitivity to water vapor: <0.1 µmol mol^{-1} CO_2 per mmol mol^{-1} H_2O

H_2O Measurement

Measurement Range: 0-60 mmol mol^{-1}

Accuracy: 1.5% of reading

Drift at 0 mmol mol^{-1}: <0.003 mmol mol^{-1} per °C

Span Drift†: <0.03% per °C

Total Drift at 10 mmol mol^{-1}: <0.009 mmol mol^{-1} per °C

RMS Noise at 10 mmol mol^{-1} with 1 sec signal averaging: <0.01 mmol mol^{-1}

Sensitivity to CO_2: <0.0001 mmol mol^{-1} H_2O per µmol mol^{-1} CO_2

LI-8150 Multiplexer

Dimensions: 40.6 cm L × 57.2 cm W × 21.1 cm H

Weatherproof Rating: Tested to IEC IP55 standard

Weight: 9.4 kg, 8 ports; 11.2 kg, 16 ports

Operating Temperature Range: -20 to 45 °C

Operating Humidity Range: 0 to 95% RH, non-condensing

Maximum Spread: 30.0 m

Flow Rate to Chambers: ~3.0 liters per minute (non-adjustable)

Flow Rate Between LI-8100A and LI-8150: ~2.0 liters per minute

Power Requirements: 10.5 VDC to 14.5 VDC (120 VAC and 240 VAC with optional power supply); from 12.5 to 60 watts, depending upon configuration

Soil Temperature Thermistor (optional): ±1.0 °C from -20 to 50 °C

8150-770 AC to DC Power Supply

Power Requirements: 115-120VAC or 230-240VAC, 50/60 Hz, 230W. Input voltage range is switch-settable

Weatherproof Rating: Tested to IEC IP55 standard

Output Voltage: 12 VDC

Operating Temperature Range: -20 to 50 °C

Dimensions: 18.1 cm D × 28 cm L × 10.2 cm H

Weight: 3.1 kg

8100-102 Survey Chamber (10 cm)

System Volume: 854.2 cm^3

Soil Area: 83.7 cm^2

Baseplate Dimensions: 15.2 cm L × 15.2 cm W × 25.4 cm H

Air Temperature Thermistor:

- **Operating Range:** -20 to 45 °C
- **Accuracy:** ±0.5 °C over 0 °C to 70 °C
- **Cable Length:** 1.01 m
- **Weight:** 1.6 kg

8100-103 Survey Chamber (20 cm)

System Volume: 4843 cm^3

Soil Area: 317.8 cm^2

Baseplate Dimensions: 28.7 cm L × 28.7 cm W × 29.2 cm H

Air Temperature Thermistor:

- **Operating Range:** -20 to 45 °C
- **Accuracy:** ± 0.5 °C over 0 °C to 70 °C
- **Cable Length:** 1.01 m
- **Weight:** 2.9 kg

8100-104 Long-Term Chamber

Volume: 4076.1 cm^3

Soil Area: 317.8 cm^2

Baseplate Dimensions: 48.3 cm L × 38.1 cm W × 33.0 cm H

Weatherproof Rating: Tested to IEC IP55 standard

Air Temperature Thermistor:

- **Operating Range:** -20 to 45 °C
- **Accuracy:** ± 0.5 °C over 0 °C to 70 °C
- **Cable Length:** 15 m
- **Weight:** 5.9 kg

8100-104C Clear Long-Term Chamber

Volume (Serial numbers 2024 and below): 4076.1 cm^3

Volume (Serial numbers 2025 and above): 3876.1 cm^3

Soil Area: 317.8 cm^2

Baseplate Dimensions: 48.3 cm L × 38.1 cm W × 33.0 cm H

Weatherproof Rating: Tested to IEC IP55 standard

Air Temperature Thermistor:

- **Operating Range:** -20 to 45 °C
- **Accuracy:** ±0.5 °C over 0 °C to 70 °C
- **Cable Length:** 15 m
- **Weight:** 5.9 kg

Accessories

Auxiliary Sensor Interface

Dimensions: 10.2 cm L × 3.8 cm W × 6.4 cm H

4 Thermocouple channels: (Type E, J, or T)

4 General input channels: (0 VDC to 5 VDC)

Power Out: 0 VDC to 5 VDC

Power In: 10.5 VDC to 28 VDC

8100-405 GPS Accessory

Size: 61 mm diameter, and 19.5 mm tall

Weight: GPS 18x PC: 180 g

Waterproof Rating: IPX7 standard, protected against water immersion

Cable Length: 2 meters

Input Voltage: 8 VDC to 30 VDC

GPS Receiver Sensitivity: -185 dBW minimum

Operating Temperature Range: -30 °C to +80 °C

Storage Temperature Range: -40 °C to +90 °C

Receiver: WAAS Enabled

Reacquisition Time: Less than 2 seconds

- **Hot:** Approx. 1 second (all data known)
- **Warm:** Approx. 38 seconds (initial position, time, and almanac known; ephemeris unknown)
- **Cold:** Approx. 45 seconds

Update Rate: 1 record per second

Position Accuracy (WAAS enabled): <3 meters, 95% typical

Velocity (WAAS enabled): 0.1 knot RMS steady state

[†]Residual error after zero correction

Specifications subject to change without notice

Ordering Information

LI-8100-P16 Sixteen Chamber Multiplexed Package

A 16-chamber system, complete with soil temperature sensors and the 16-port multiplexer, provides the largest sample size.

Includes:

- LI-8100A Analyzer Control Unit
- LI-8150-16 Multiplexer
- Sixteen 8100-104 Long-Term Chambers
- Sixteen 8150-705 Cable/Hose Assemblies
- Sixteen 8150-203 Soil Temperature Thermistors
- 8150-706 DC Power Cable
- 8150-770 AC to DC Power Supply

LI-8100-P8 Eight Chamber Multiplexed Package

The 8-chamber system and 8-port multiplexer.

Includes:

- LI-8100A Analyzer Control Unit
- LI-8150-8 Multiplexer
- Eight 8100-104 Long-Term Chambers
- Eight 8150-705 Cable/Hose Assemblies
- Eight 8150-203 Soil Temperature Thermistors
- 8150-706 DC Power Cable
- 8150-770 AC to DC Power Supply

LI-8100-M1 Four Chamber Multiplexed Package

A 4-chamber system and 8-port multiplexer for long-term measurements. Ideal if you want to use up to 8 chambers at a later time or use the surplus ports for ancillary measurements such as profile sampling or flask sampling.

Includes:

- LI-8100A Analyzer Control Unit
- LI-8150-8 Multiplexer
- Four 8100-104 Long-Term Chambers
- Four 8150-705 Cable/Hose Assemblies
- 8150-706 DC Power Cable
- Auxiliary sensors sold separately

LI-8100-M2 Four Chamber Multiplexed Package

A 4-chamber system and 16-port multiplexer for long-term measurements. Ideal if you want to use up to 16 chambers at a later time or use the surplus ports for ancillary measurements such as profile sampling or flask sampling.

Includes:

- LI-8100A Analyzer Control Unit
- LI-8150-16 Multiplexer
- Four 8100-104 Long-Term Chambers
- Four 8150-705 Cable/Hose Assemblies
- 8150-706 DC Power Cable
- Auxiliary sensors sold separately

LI-8150-M3 Four Chamber Multiplexed Package

A 4-chamber system and 8-port multiplexer. Ideal if you already have an Analyzer Control Unit and you want to use up to eight chambers at a later time or use the surplus ports for ancillary measurements such as profile sampling or flask sampling.

Includes:

- LI-8150-8 Multiplexer
- Four 8100-104 Long-Term Chambers
- Four 8150-705 Cable/Hose Assemblies
- 8150-706 DC Power Cable
- Auxiliary sensors sold separately

LI-8150-M4 Four Chamber Multiplexed Package

A 4-chamber system and 16-port multiplexer. Ideal if you already have an Analyzer Control Unit and want to use up to 16 chambers at a later time or use the surplus ports for ancillary measurements such as profile sampling or flask sampling.

Includes:

- LI-8150-16 Multiplexer
- Four 8100-104 Long-Term Chambers
- Four 8150-705 Cable/Hose Assemblies
- 8150-706 DC Power Cable
- Auxiliary sensors sold separately

LI-8100-NCE Net Carbon Exchange Package

Ideal for net carbon exchange measurements, this has one clear chamber with numerous ancillary sensors.

Includes:

- LI-8100A Analyzer Control Unit
- 8100-104C Clear Chamber
- 8100-704 Cable/Hose Assembly
- 8100-202 Soil Moisture Probe
- 8100-203 Soil Temperature Thermistor Probe
- Quantum Sensor
- Light Sensor Amplifier
- 8100-604 Leveling Stake
- 8100-565 Wireless Communications Package

LI-8100A-SL1 Survey and Long-Term Package

Ideal for gaining a basic understanding of spatial and diurnal variation.

Includes:

- LI-8100A Analyzer Control Unit
- 8100-103 20-cm Survey Chamber
- 8100-104 Long-Term Chamber
- Three 6400-03 Batteries
- LI-6020 Battery Charger
- 8100-202 Soil Moisture Probe
- 8100-203 Soil Temperature Thermistor Probe
- 8100-704 Cable/Hose Assembly

Individual components and accessories also available from **www.licor.com/env** or your local distributor.

LI-8100A-S1 Survey Package I

A complete system for survey measurements using the 10-cm survey chamber.

Includes:

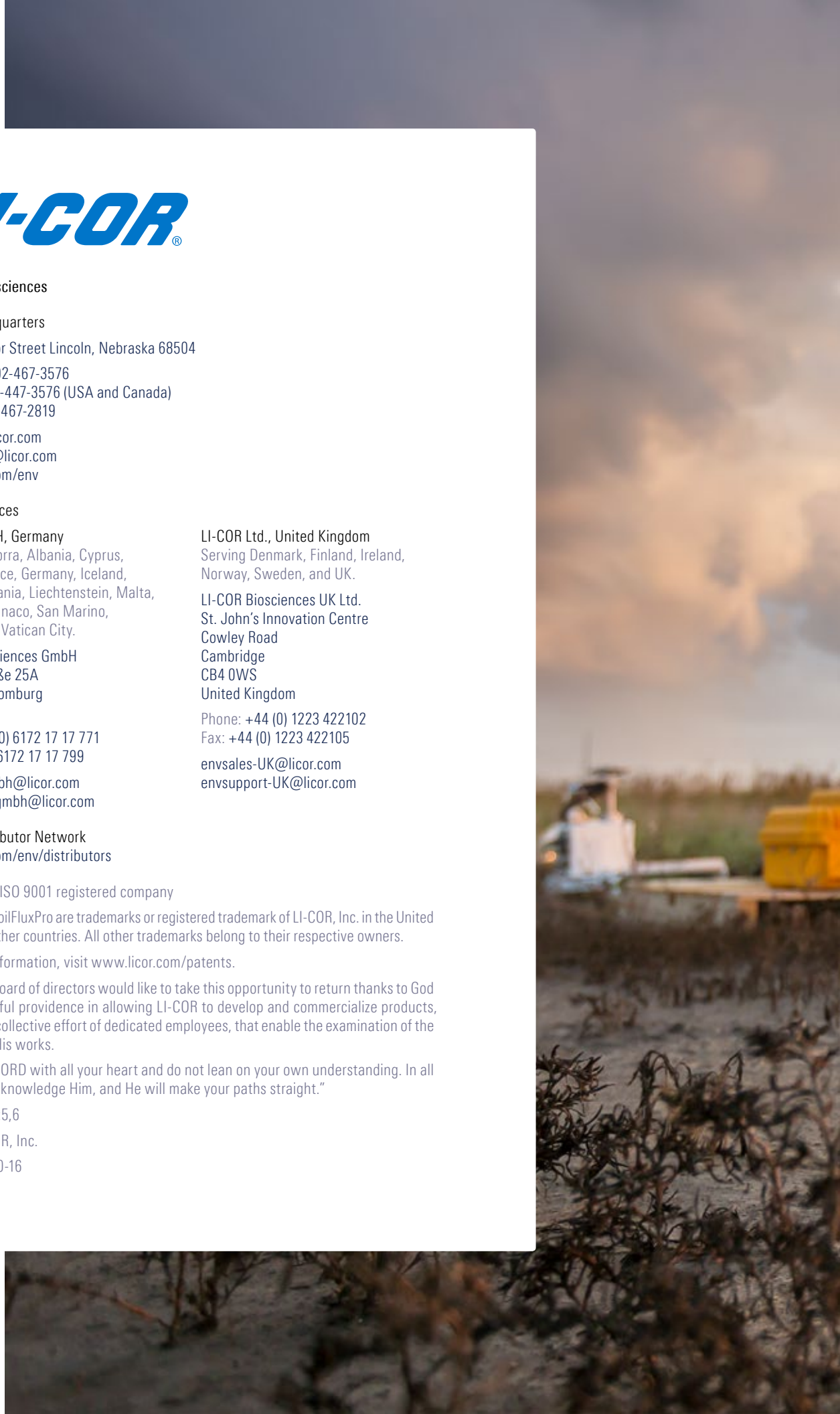
- LI-8100A Analyzer Control Unit
- 8100-102 10-cm Survey Chamber
- Three 6400-03 Batteries
- LI-6020 Battery Charger
- 8100-202 Soil Moisture Probe
- 6000-09TC Soil Temperature Thermocouple

LI-8100A-S2 Survey Package 2

A complete system for survey measurements using the 20-cm survey chamber.

Includes:

- LI-8100A Analyzer Control Unit
- 8100-103 20-cm Survey Chamber
- Three 6400-03 Batteries
- LI-6020 Battery Charger
- 8100-202 Soil Moisture Probe
- 6000-09TC Soil Temperature Thermocouple



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The LI-COR board of directors would like to take this opportunity to return thanks to God for His merciful providence in allowing LI-COR to develop and commercialize products, through the collective effort of dedicated employees, that enable the examination of the wonders of His works.

"Trust in the LORD with all your heart and do not lean on your own understanding. In all your ways acknowledge Him, and He will make your paths straight."

– Proverbs 3:5,6

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