

Trace Gas Analyzers

High performance CO₂, CO₂ Isotope, NH₃, CH₄, and N₂O gas analyzers for the field, the lab, and mobile applications.



Go wherever your research takes you.

LI-7810 CH₄/CO₂/H₂O Trace Gas Analyzer

LI-7815 CO₂/H₂O Trace Gas Analyzer

LI-7820 N₂O/H₂O Trace Gas Analyzer

LI-7825 CO₂ Isotope/NH₃ Trace Gas Analyzer

LI-COR[®]

Precision, stability, and portability

For over 35 years, LI-COR infrared gas analyzers have been used and trusted by researchers and networks around the world.

LI-COR Trace Gas Analyzers provide the same exceptional performance in the lab, in the field, or on the move for CO₂, CO₂ Isotopologue, NH₃, CH₄, and N₂O measurements. With low power and low maintenance requirements, LI-COR Trace Gas Analyzers are rugged and reliable enough for the most extreme and remote locations, even at high altitudes.

Patented design

LI-COR Trace Gas Analyzers use Optical Feedback-Cavity Enhanced Absorption Spectroscopy (OF-CEAS) complemented by several patented technologies¹ and innovations. Our unique approach to OF-CEAS enhances precision and stability. The high-finesse optical cavity allows the laser to be reflected through the cavity multiple times, enhancing the signal several fold.

The technology and sophisticated signal processing result in a cost-effective analyzer that consistently delivers high performance and requires minimal maintenance. LI-COR Trace Gas Analyzers merge the precision of a bench analyzer with portability and flexibility for a range of research applications.

1. U.S. patents 8659758, 8665442, 8885167, 9116047, 9194742, 9304080, 9581492, 9678003, 9759654, 9759655, 9989729, and 10060942. Additional patents pending in the U.S. and other countries.

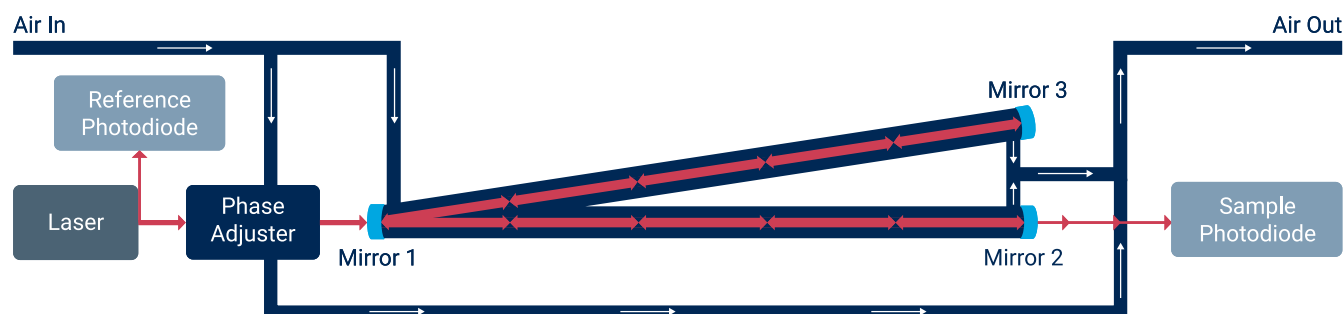


Figure 1. Simplified schematic of the Trace Gas Analyzer flow path through the optical bench. The phase adjuster is a volume in the path between the laser and optical bench that is tied to a pressure control mechanism. Changing the pressure of that volume alters the refractive index which subsequently modifies the phase of the laser.

Versatile for many applications

With a durable, weather-resistant case and wide operating temperature range, LI-COR Trace Gas Analyzers can be deployed under a simple shelter in ambient temperature in many areas. Multiple analyzers can be plumbed in parallel for combined CO₂, CO₂ Isotopologue, NH₃, CH₄, and N₂O measurements from a single source.



* Wi-Fi connectivity limited in some countries

Web-enabled for convenience

- Wi-Fi and a built-in web server with software make connecting to a computer, smart phone, or tablet effortless.
- Software is designed for quick access to measurement data, status information, and configuration options.
- Built-in storage holds two months of data.
- Support for direct connection to a PC or Ethernet-compatible datalogger expands data storage options.

LI-COR Trace Gas Analyzers are now supported by GCWerks software to simplify your remote data acquisition, instrument calibration, and system monitoring.

Go to www.licor.com/tracegas for more information, case studies, and research.

LI-7810 CH₄/CO₂/H₂O Trace Gas Analyzer

The LI-7810 delivers exceptionally stable and precise CH₄ measurements. The instrument is ideal for atmospheric CH₄ monitoring, combined CH₄/CO₂ soil gas flux measurements, and high-precision methane measurement applications.



LI-7810 7-Day CH₄ Precision with Allan Deviation Plot

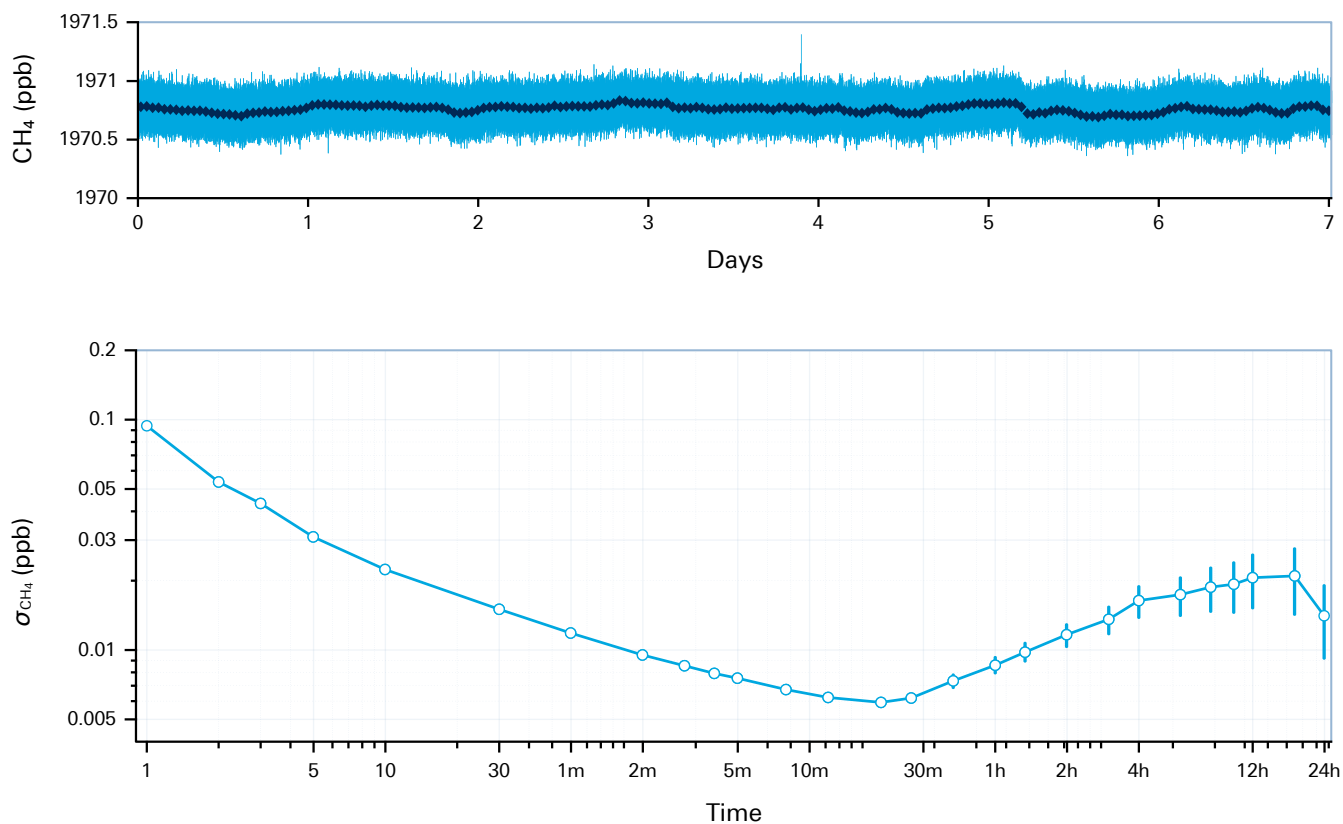


Figure 2. CH₄ stability data from an LI-7810 as it measured continuously flowing tank gas (1970.7 ppb CH₄ and 387.5 ppm CO₂) over a 7-day period. The light blue line (top) is the 1-second CH₄ output; the dark blue line is the 50-minute block average. The Allan deviation plot (bottom) is CH₄ precision with 1-second averaging. Precision improves as averaging time increases. Error bars represent 68% ($\pm 1\sigma$) confidence intervals based on number of averaged time series available at each τ .

Applications

The LI-7810 is ideal for a range of applications—from atmospheric CH₄ monitoring to mobile monitoring, to soil CH₄ and CO₂ flux measurements. It easily connects to the Smart Chamber or LI-8250 Multiplexer for survey or long-term soil CH₄/CO₂ gas flux measurements.

- Atmospheric monitoring
- Soil gas flux measurements
- Mobile measurement systems
- Wetland and lake emissions
- Small volume injections
- Sampling from flasks
- Urban emissions monitoring
- pCH₄ measurement systems
- Sensor networks
- Large area emissions monitoring
- Fugitive emissions detection
- High altitude sites

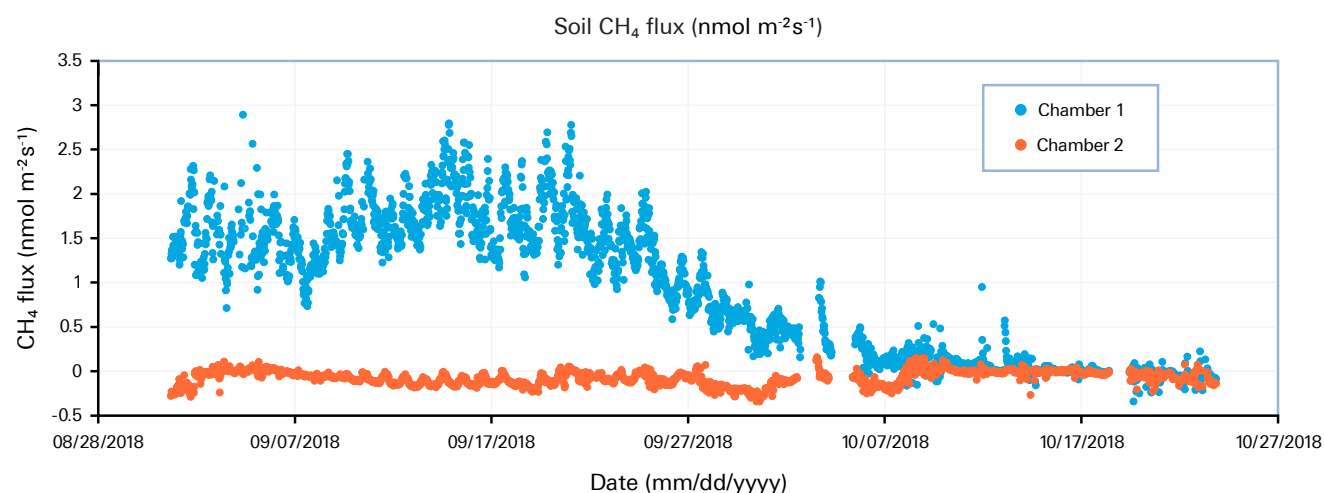


Figure 3. Seasonal soil CH₄ flux variations observed using the LI-7810 CH₄/CO₂/H₂O Trace Gas Analyzer and the LI-8150 Multiplexer with 8100-104 Long-Term Chambers. Chamber 1 site was a source of emissions up to 2.8 nmol m⁻²s⁻¹—which was unexpected for grassland. By October, the site had become a sink. Chamber 2 site was typically a sink with rates ~-0.2 nmol m⁻²s⁻¹. This was expected and consistent with published rates.

Specifications

CH₄ Measurements

Response Time (T₁₀-T₉₀): all from 0 to 2 ppm
≤ 2 seconds in *Standard Configuration*
≤ 3 seconds in *High Altitude Configuration*
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

CO₂ 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

H₂O 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

Specifications subject to change without notice

LI-7815 CO₂/H₂O Trace Gas Analyzer

The LI-7815 is designed for long-term atmospheric CO₂ measurements, and is ideal for mobile monitoring systems, emissions monitoring applications, and pCO₂ analysis systems.



LI-7815 24-Hour CO₂ Precision with Allan Deviation Plot

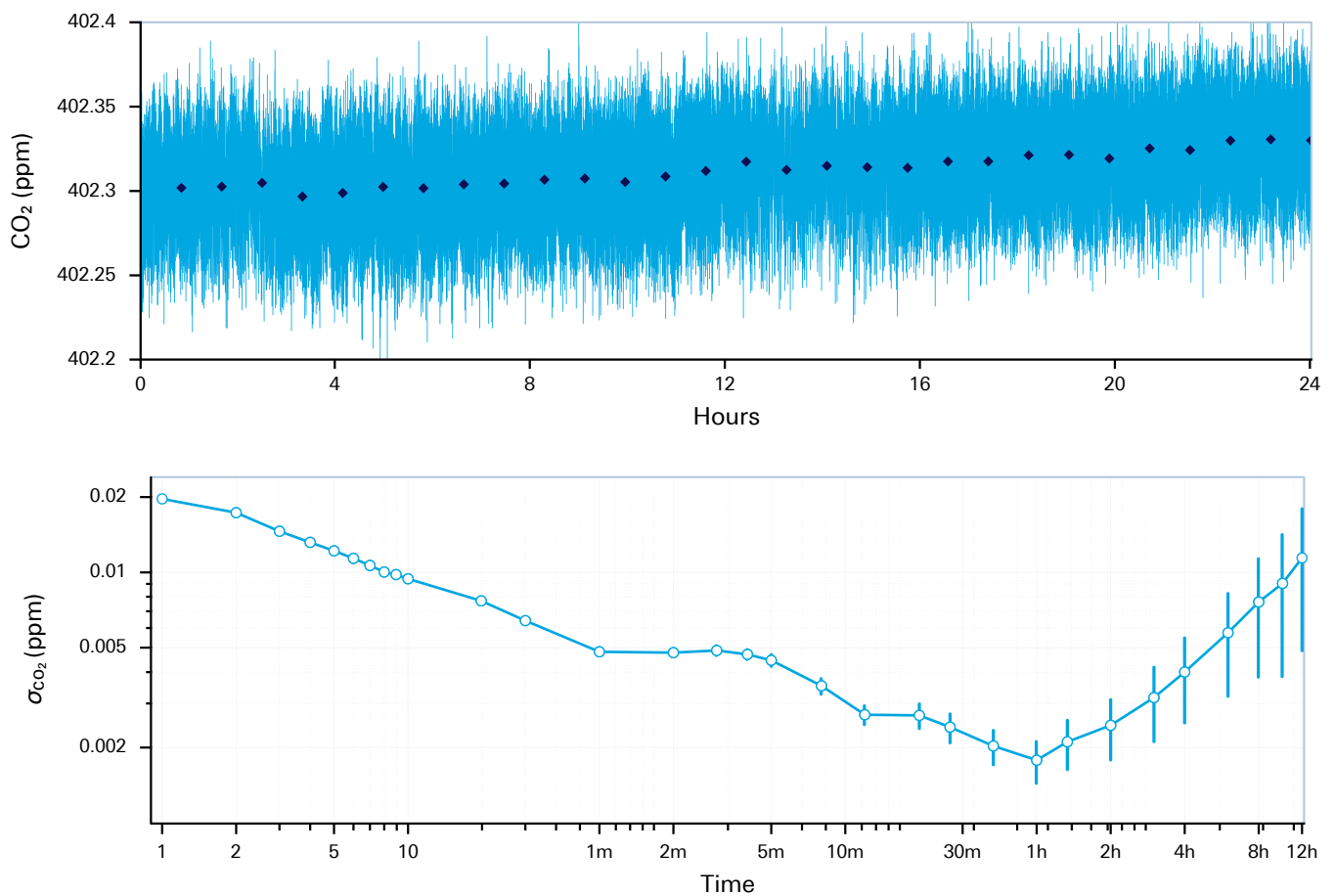


Figure 4. CO₂ stability data from an LI-7815 as it measured continuously flowing tank gas (402.3 ppm CO₂) for a 24-hour period. The blue line (top) shows 1-second measurements; the diamond line shows a 50-minute block average. The Allan deviation plot (bottom) of CO₂ precision with 1-second signal averaging. Precision improves as averaging time increases. Error bars represent 68% ($\pm 1\sigma$) confidence intervals based on number of averaged time series available at each τ .

Applications

The LI-7815 provides the high precision, accuracy, and stability required by leading atmospheric monitoring organizations.

- Atmospheric CO₂ monitoring
- Sensor networks
- Urban emissions monitoring
- Mobile emissions monitoring
- pCO₂ measurement systems
- Large area emissions monitoring
- Fugitive emissions
- High altitude sites



Specifications

CO₂ Measurements

Response Time ($T_{10}-T_{90}$): all from 0 to 400 ppm

≤ 2 seconds in *Standard Configuration*

≤ 3 seconds in *High Altitude Configuration*

Range: 0 to 10,000 ppm

Precision (1σ):

0.10 ppm at 400 ppm with 1 second averaging

0.04 ppm at 400 ppm with 5 second averaging

Maximum Drift: < 0.2 ppm per 24-hour period

H₂O 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

Specifications subject to change without notice

LI-7820 N₂O/H₂O Trace Gas Analyzer

The LI-7820 provides precise N₂O measurements that are ideal for chamber-based soil gas flux research and more. When coupled with LI-COR soil gas flux systems, it can measure short-term natural variations of N₂O and large emission events. Capable of measuring flux rates as low as 0.05 nmol m⁻² s⁻¹ in a 2-minute measurement, the LI-7820 measures flux from soils in a fraction of the time required by traditional analyzers.

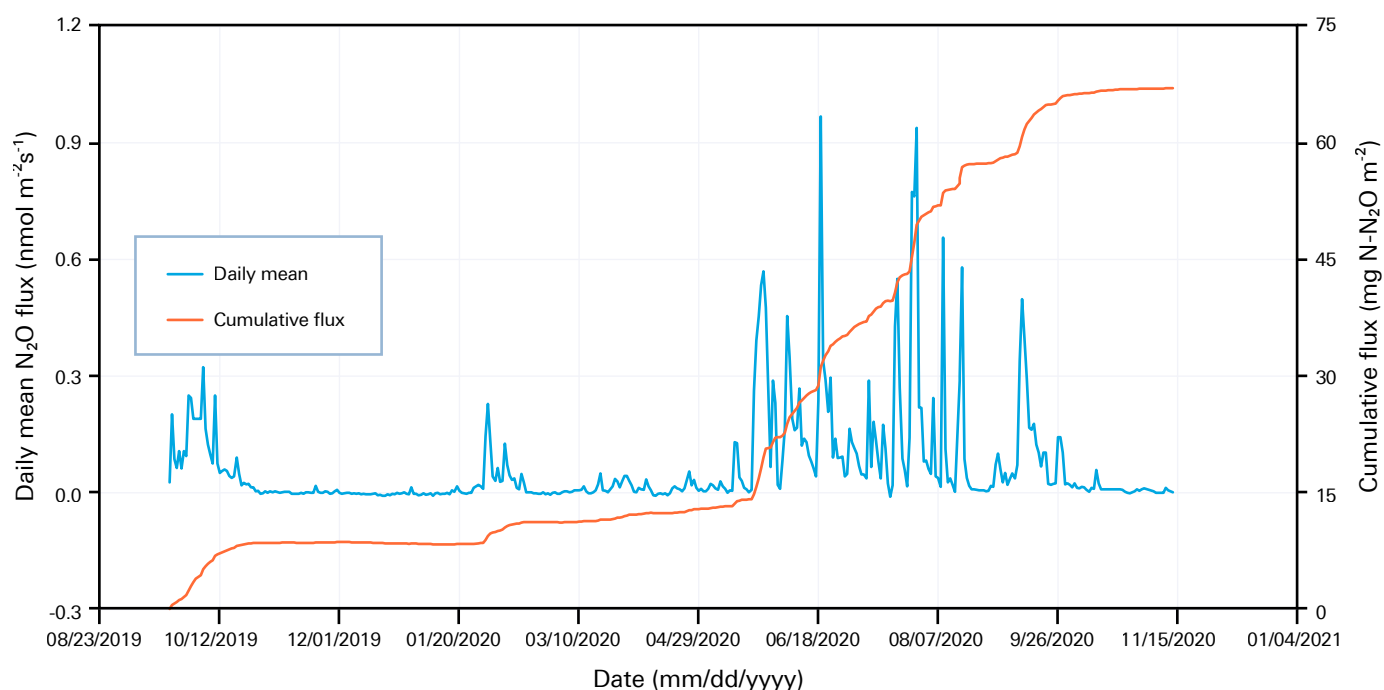


Figure 5. Measurements of N₂O flux from soils over a 14-month time period. Measured by the LI-7820 N₂O/H₂O Trace Gas Analyzer and an LI-8100A Automated Soil CO₂ Flux System. Measurements were conducted over an urban lawn in Lincoln, NE, USA, and shows natural variations of N₂O fluxes detected by the LI-7820. Results from Xu, et al., 2020.²

2. Xu., Liukang, Minish, K., Trutna, D. (2020). How do soil temperature and moisture regulate N₂O flux from an urban lawn? Exhibited at AGU Annual Meeting 2020, December 1 - December 17, 2020.

Applications

The LI-7820 is ideal for soil gas exchange measurements and general-purpose monitoring. It easily connects to the Smart Chamber or LI-8250 Multiplexer for survey or long-term soil N₂O flux measurements.

- Soil gas flux measurements
- Atmospheric monitoring
- Large area emissions monitoring
- Animal agriculture N₂O flux measurements
- Urban emissions monitoring
- Mobile emissions monitoring
- N₂O measurements in sensor networks
- High altitude sites

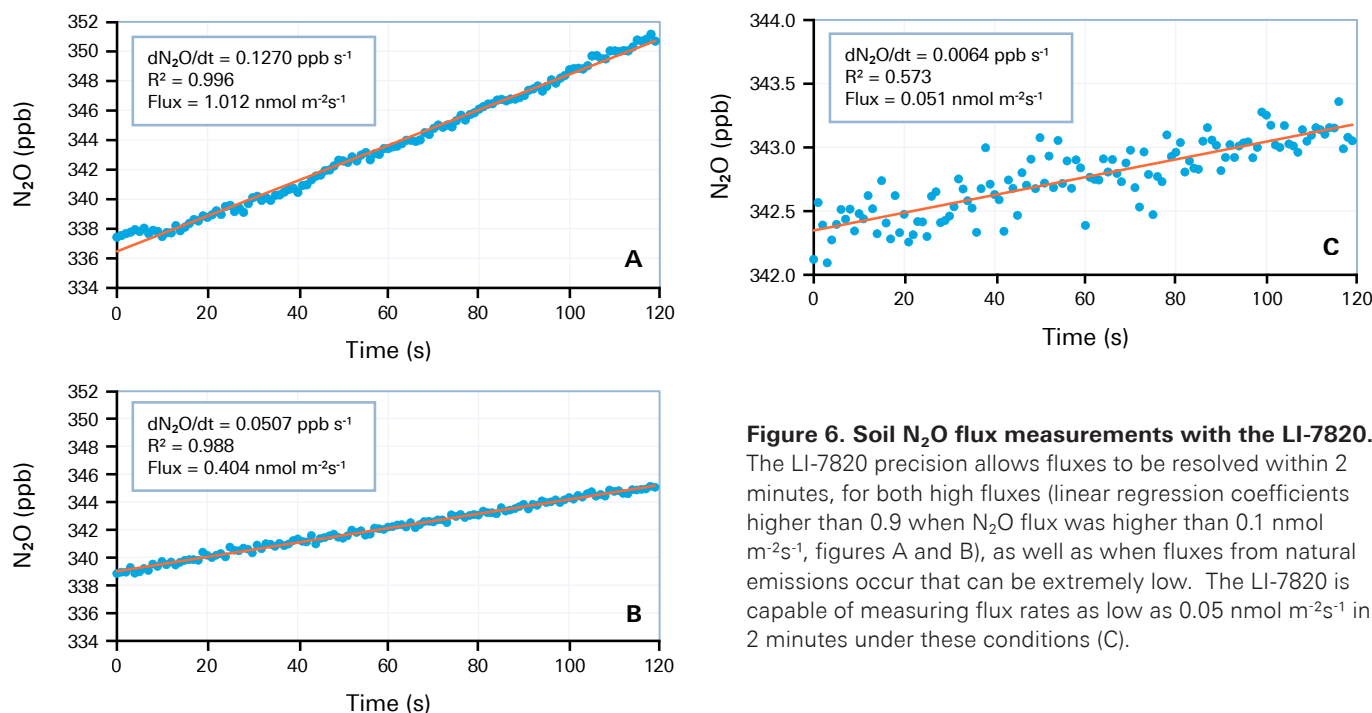


Figure 6. Soil N₂O flux measurements with the LI-7820.

The LI-7820 precision allows fluxes to be resolved within 2 minutes, for both high fluxes (linear regression coefficients higher than 0.9 when N₂O flux was higher than 0.1 nmol m⁻²s⁻¹, figures A and B), as well as when fluxes from natural emissions occur that can be extremely low. The LI-7820 is capable of measuring flux rates as low as 0.05 nmol m⁻²s⁻¹ in 2 minutes under these conditions (C).

Learn more about using the LI-7820 with the Smart Chamber or LI-8250 Multiplexer at www.licor.com/soil

Specifications

N₂O Measurements

Response Time (T₁₀-T₉₀): all from 0 to 330 ppb

≤ 2 seconds in *Standard Configuration*

≤ 3 seconds in *High Altitude Configuration*

Range: 0 to 100 ppb

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

H₂O 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-7825 CO₂ Isotope/NH₃ Trace Gas Analyzer

The LI-7825 CO₂ Isotope/NH₃ Trace Gas Analyzer measures the four most abundant CO₂ gas isotopologues in air and reports $\delta^{13}\text{C}$, $\delta^{17}\text{O}$, and $\delta^{18}\text{O}$ with high precision and accuracy. By measuring CO₂ isotopologues and calculating isotope ratios, researchers can:

- Identify the sources and sinks of atmospheric carbon
- Partition net ecosystem carbon exchange
- Gain insight into biological processes
- Evaluate carbon sequestration efforts

Measuring atmospheric CO₂ isotopologues

The LI-7825 meets or exceeds requirements for long-term atmospheric background measurements and offers a versatile platform for a range of applications for a better understanding of CO₂ emissions from anthropogenic and natural sources.

Measuring NH₃

The LI-7825 measures higher concentrations of NH₃, and is suitable for detecting ammonia in livestock barns, feedlots, barnyards, fertilizer applications, fence line monitoring, ammonia leaks, and other applications where NH₃ concentration is elevated above natural abundance.

Applications

- Atmospheric monitoring
- Urban emissions monitoring
- Mobile emissions monitoring
- Large area emissions monitoring
- Sensor networks
- Mud gas logging

LI-7825 10-Day Precision with Allan Deviation Plots

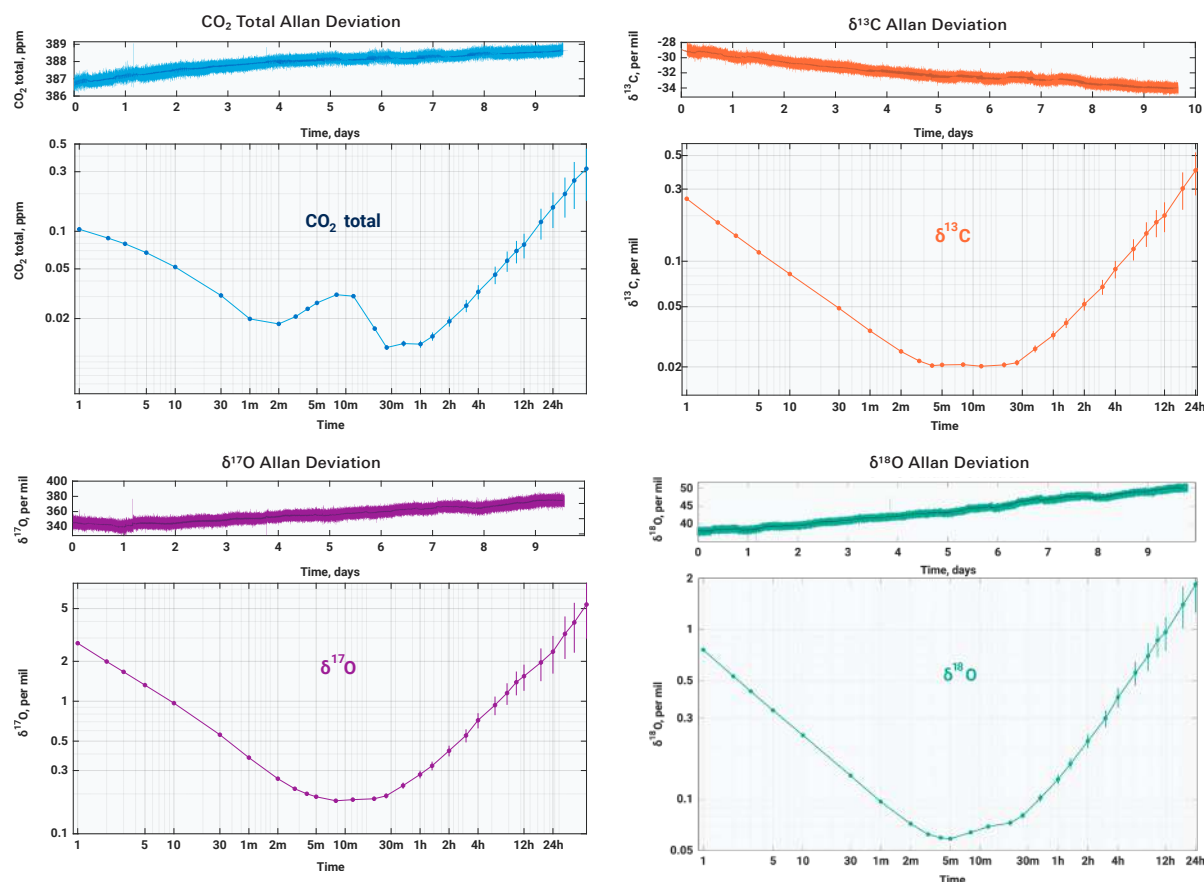


Figure 7. Ten-day CO₂ Isotope stability data from an LI-7825 CO₂ Isotope/NH₃ Trace Gas Analyzer. Data for the Allan Deviation plots were collected over a 10-day period, where, prior to the measurement of test gas, the LI-7825 was powered on to sample ambient air for 24 hours. For the study, it was connected to a 400 ppm CO₂ tank with stainless steel tubing.

Specifications

CO₂ Measurements

Response Time ($T_{10}-T_{90}$): ≤ 2 seconds from 0-400 ppm

Range: 50 to 2,000 ppm

Precision (1σ):

0.05 ppm at 400 ppm with 5-minute averaging

Maximum Drift: < 0.5 ppm per 24-hour period

$\delta^{13}\text{C}$ Measurements

Precision (1σ):

< 0.5 ‰ at 400 ppm CO₂ with 1 second averaging

0.04 ‰ at 400 ppm CO₂ with 5-minute averaging

Maximum Drift: < 1 ‰ per 24-hr period

$\delta^{18}\text{O}$ Measurements

Precision (1σ):

0.1 ‰ at 400 ppm CO₂ with 5-minute averaging

Maximum Drift: < 4 ‰ per 24-hr period

$\delta^{17}\text{O}$ Measurements

Precision (1σ):

0.4 ‰ at 400 ppm CO₂ with 5-minute averaging

Maximum Drift: < 12 ‰ per 24-hr period

NH₃ Measurements

Range: 0-30,000 ppb

Precision (1σ):

2 ppb at 300 ppb with 1 second averaging

Response Time ($T_{10}-T_{90}$): ~5 minutes. *

H₂O 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

*NH₃ measurement response time is dependent upon gas composition and inlet pneumatic configuration including tubing/fitting materials, flow rates, and upstream volumes.

Specifications subject to change without notice

General Specifications

These general specifications apply to all analyzers.
See individual analyzers for measurement specifications.

Measurement Technique: OF-CEAS (Optical Feedback-Cavity Enhanced Absorption Spectroscopy)

Measurement Rate: 1 sample per second (1 Hz)

Optical Cavity Volume: 6.41 cm³

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 °C 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 W at 25 °C without batteries charging

Warm up: 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 VDC 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



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