

A tall, white, tripod-mounted eddy covariance measurement system stands in a grassy field under a blue sky with scattered clouds. The system features a horizontal arm with various sensors, including a white dome-shaped anemometer at the top, a smaller sensor, and a horizontal probe. A control box labeled 'EddyFlux System' is attached to the tripod. The background shows a blurred landscape of green fields and trees.

Eddy Covariance Solutions

# Designed to meet changing research needs

- ① Reliable Data Collection
- ② Automated Flux Computation
- ③ Reproducible Post-processing

# Eddy covariance research has changed

Instrument technology and software are rapidly developing, and regional and global flux networks continue to discover new benefits of integrating and combining datasets from standalone sites for understanding trends.



## Standardization is key

For eddy covariance results to be reliably interpreted, observations must accurately reflect genuine differences in ecosystem-level gas and energy exchange – without bias and error introduced by the non-standardization of analyzers and processing methods.

## Results, not just data

Eddy covariance research is moving faster than ever before. For publication and submission to network databases, the need for fast and dependable fully-processed, formatted, and reproducible results has never been greater.

## Constant change and innovation

From new sonic anemometer geometries to advanced time and synchronization capabilities, eddy covariance systems must be adaptable and flexible to accommodate the latest technological advancements.

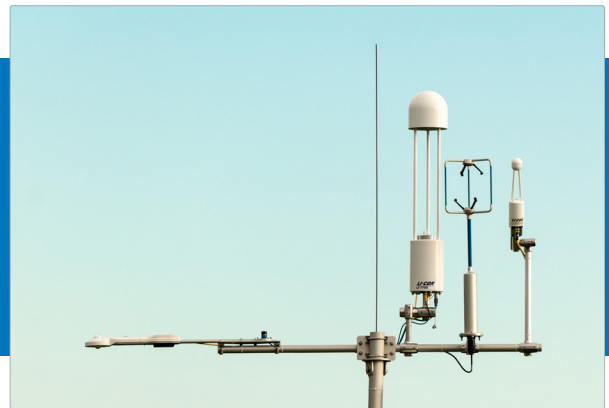
# LI-COR offers the only complete solutions designed to meet changing research needs and deliver publishable results.

Standardization, a focus on results, and adaptability are the driving forces behind LI-COR EC systems, with special attention being paid to every step in the eddy covariance research process.

1

## Reliable Data Acquisition

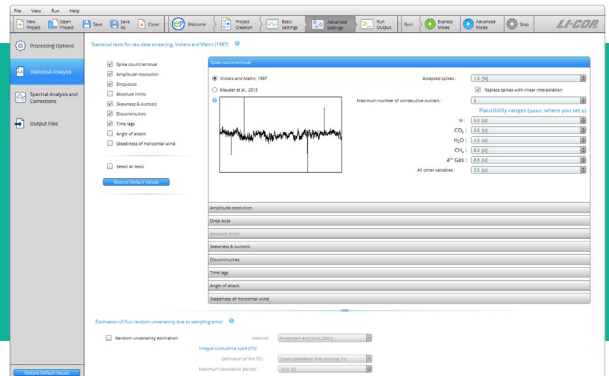
High-precision, low-power, flexible digital instrument platforms chosen as standard by global flux networks.



2

## Automated Flux Computation

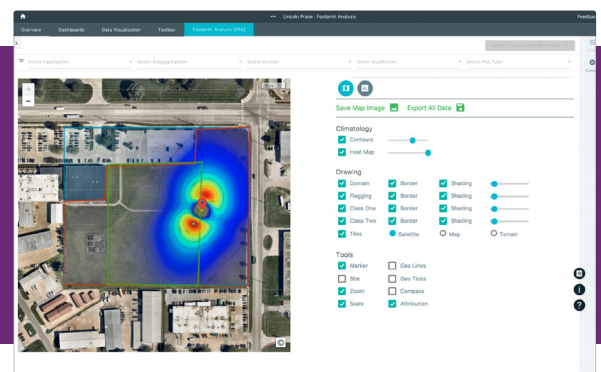
Fully-processed and corrected fluxes on demand and precision digital instrument integration with EddyPro® Software and SmartFlux® Systems.



3

## Reproducible Post-processing

Ecosystem insights and publishable results faster and more reliably than ever before with Tovi™ Software.



# 1

## Reliable Data Collection

### with Eddy Covariance Instruments

LI-COR eddy covariance systems can be customized from the most basic single-analyzer setup to advanced systems that measure methane flux, biological and meteorological variables, and fluxes from integrated soil gas flux systems.

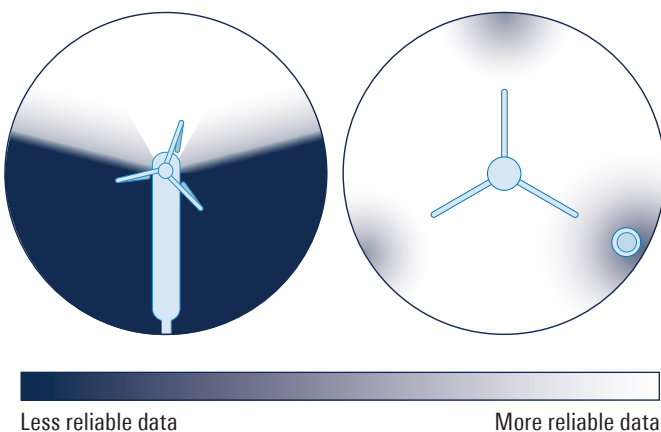
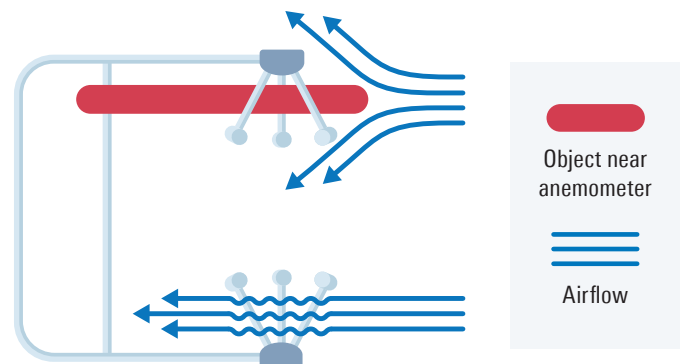


### Chosen by major flux networks as their standard instruments after rigorous independent testing

Leading eddy covariance researchers consistently rely on the stable, dependable performance and wide compatibility range with digital instruments that LI-COR instrument platforms offer.

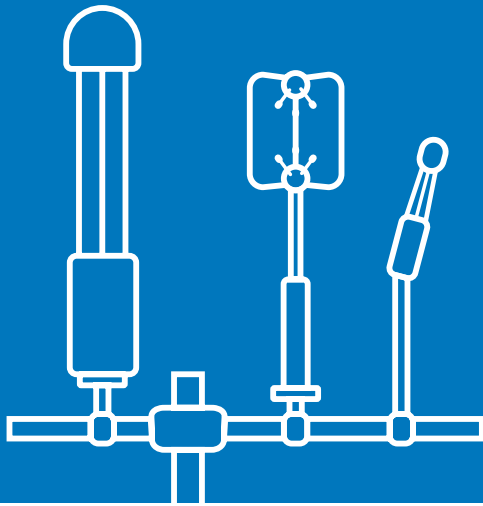
### Ideal instrument separation reduces flow distortion

When the gas analyzer is placed inside the sonic anemometer, the wind flow is split, and the vertical wind used in flux calculations is distorted. Separating the analyzer from the sonic allows unobstructed wind flow.



### Omnidirectional positioning gives greater data coverage with fewer gaps

With the gas analyzer inside a c-clamp configuration, data is not reliable from wind directions within ~180 degrees of the back of the clamp. With LI-COR systems, data is reliable from nearly all wind directions.



## Demand the most from your eddy covariance instruments.

LI-COR instruments have consistently beat the competition in comparative testing, and it's no coincidence. From laboring over the optimal instrument placement to providing continuous software updates to integrate the latest digital sonic anemometer options, LI-COR's forward-thinking innovation in eddy covariance will continue to provide you the highest quality data for years to come.

### Key Feature

**Omnidirectional Instrument Positioning**

**Instruments Separated to Reduce Distortion of Flow**

**Temperature-regulated Optical Components**

**Low Power Requirements**

**Ability to Integrate Multiple Digital Sonic Anemometer Models**

**Ability to Integrate Soil Gas Flux Measurements**

**Streamlined Data Analysis Pipeline**

### The LI-COR Advantage

The analyzer and sonic anemometer configuration of LI-COR instrument platforms allows for reliable data from nearly any wind direction.

Sensor separation with all available LI-COR instrument models mitigates the distortion of air flow through the sonic anemometer that is found in co-located configurations.

LI-COR instrument optics are temperature regulated, meaning performance specifications apply over the broadest range of temperatures (-25 to 50 °C), providing robust data in many environments.

The LI-7500DS only draws 4 W of power – the lowest of comparable analyzers – and is ideal for remote deployment.

To meet your individual research needs, LI-COR systems can be configured with more than 10 digital anemometer models from different manufacturers, including heated and omnidirectional models.

The SmartFlux® System in LI-COR platforms automatically integrates and synchronizes data from LI-COR soil gas flux systems into a single data file.

Data from LI-COR instruments are optimized for processing and integration with other digital instruments using EddyPro® Software and SmartFlux® Systems, and for post-processing with Tovi™ Software.

# 2

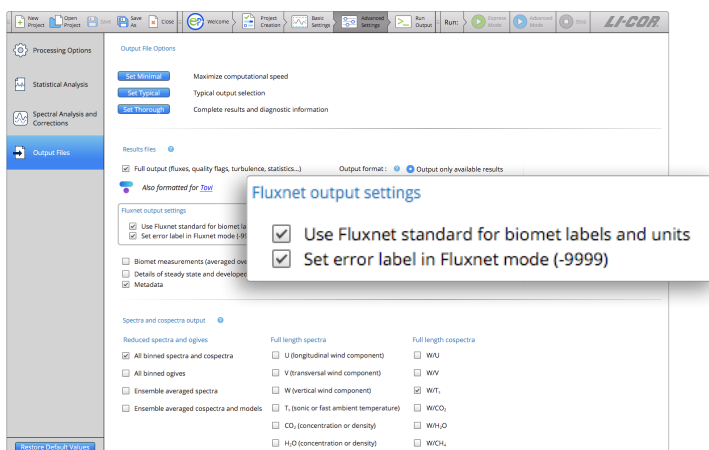
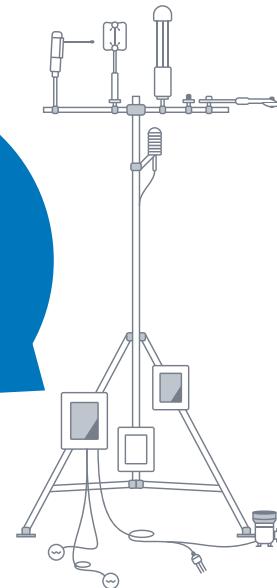
## Automated Flux Computation

with EddyPro<sup>®</sup> 7 Software and the SmartFlux<sup>®</sup> System

EddyPro and SmartFlux effortlessly deliver the highest quality flux data in real time with new standardized processing steps and formatting requirements from FLUXNET, ICOS, CERN, AmeriFlux, and other networks.

### Powerful field-based microprocessor

The embedded computer in SmartFlux applies all processing steps and corrections from EddyPro in real time and provides fully-calculated fluxes in the field.



### Developed in ongoing collaboration with international networks

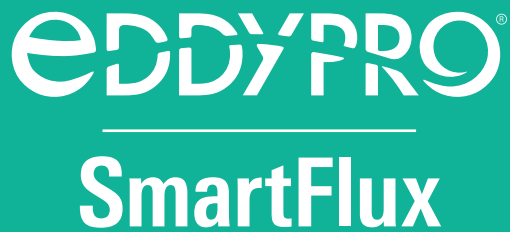
With new standardized outputs, EddyPro 7 delivers flux data that allows the most accurate comparisons across sites.

### Precision GPS clock synchronization

Advanced data management algorithms synchronize data from biomet sensors with high-speed wind and gas data into self-contained eddy covariance data files with sub-microsecond precision.



**10<sup>-6</sup>  
second  
synchronization**



## The EddyPro and SmartFlux Advantage

With over 500 peer-reviewed publications and continuous improvements driven by partnerships with the eddy covariance community, EddyPro has redefined the standard for flux processing software. When you need to publish your data or collaborate globally, the choice is clear.

### Key Feature

**Field-based Microprocessor**

**Incorporates Widely-published and Accepted Corrections and Calculations**

**Reproducibility Between Desktop and Embedded Software**

**Site Specific and User-Specified Processing**

**Microsecond Time Synchronization**

**Point-and-Click User Experience**

**Data Outputs Designed to Meet Flux Network Standards**

**Extensive Resources and Experienced and Dedicated Support Team**

### The LI-COR Advantage

The ARM Cortex 720 MHz processor in SmartFlux applies over 50 flux processing algorithms in real time.

SmartFlux corrects and processes fluxes using the peer-reviewed calculations and algorithms from EddyPro, including corrections and spectral analysis.

EddyPro produces the exact same results on a PC or in a SmartFlux System. Allowing for easy replication across devices and sites. Comparable packages use different code bases for embedded and desktop software, making reproducibility difficult.

With LI-COR systems, flux processing routines can be customized for individual sites. Logger software in comparable systems only computes minimal, approximated flux data without many critical steps.

SmartFlux integrates and synchronizes biomet and high-speed digital wind and gas analyzer data, ensuring fluxes are not biased by random and systematic timing errors.

EddyPro features a thoughtfully-designed and implemented graphical user interface. Comparative loggers require custom programming with proprietary language.

EddyPro outputs are designed to meet the latest FLUXNET, ICOS, and AmeriFlux database standards without any additional post-processing.

A variety of support resources are available for EddyPro and SmartFlux along with a team of support scientists always ready to assist you.

# 3

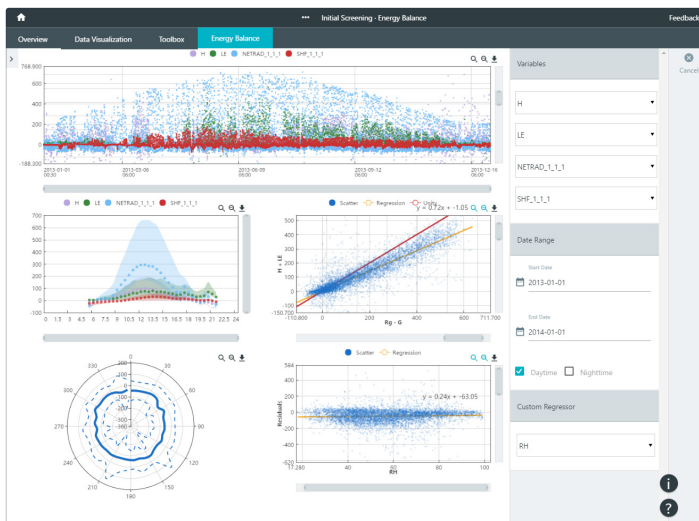
## Reproducible Post-processing

with Tovi™ Software

Get to publication faster and more reliably than ever before. With Tovi, LI-COR systems now offer the only end-to-end solution designed to streamline post-processing for reproducible eddy covariance results.

### Footprint Modeling, Footprint-Driven Flux Allocation, and Automated Weather Station Data Retrieval

Get meteorological data from nearby weather stations and gain complete flux data for your carbon budget analysis and visually segment your models to assess the contribution of individual areas within your tower footprint.



### Flux Partitioning, Gap Filling, u\* Threshold Detection, Energy Balance Dashboard

Partition your Net Ecosystem Exchange (NEE) fluxes into individual components, fill gaps in your flux data, determine the u\* threshold for flux quality analysis, and visualize the energy balance for your site

### QC, Data Consolidation, Visualization, and Statistical Analysis

Make your complex eddy covariance data understandable, accessible, and usable. QC your data, discover trends visually in graphs and plots, and easily identify areas in need of gap filling.







## Why Tovi?

Eddy covariance data analysis doesn't end with fully-processed fluxes. Perform a complete, scientifically-sound analysis on your EddyPro outputs and provide complete documentation of your processing steps for publication and collaboration in a fraction of the time it takes with similar applications.

- ✓ Get to your results quicker.
- ✓ Get to experimental evaluation sooner.
- ✓ Get more done in a grant cycle.
- ✓ Get onto new projects sooner.

### Key Feature

**Automated and Standardized Post-Processing Calculations**

**Complete, End-to-End Post-Processing**

**Transparency and Reproducibility**

**Automatic Citation Generation**

**Extensibility**

**Data Processing Confidence**

### The Tovi Advantage

Be confident that your analysis is performed correctly and consistently each and every time. Remove site-to-site and user-to-user bias and error from your results.

No need for multiple software applications or complex statistical software packages: from data import to QC, Gap Filling,  $u^*$  Threshold Detection, and Partitioning, Tovi allows for a complete post-processing workflow.

Comprehensive results exports contain complete documentation of your analysis, providing transparency for reproducible results. Collaborators and reviewers can quickly and easily review and even reproduce your results.

Citations are automatically generated for the tools you use in your analysis, and researchers can collaborate and get their code implemented for users around the globe.

Unique, integrated Python and R Programming Notebook extends the features of Tovi to advanced users, while the simpler graphical user interface remains straightforward for new students and new lab members.

The calculations and algorithms used in Tovi are the exact same peer-reviewed, open source tools used by the eddy covariance community and flux networks around the world.

**Additional features include automated workflow documentation and revision control, processing log, citation generator, and more.**

**Try it free**  **tovi.io**

# The LI-COR Eddy Covariance Difference

Go from raw data to publishable, reproducible results faster and with greater confidence.



Reliable Data Collection ✓

Rapid, precise, and highly-configurable digital instrument platforms that have been chosen as the global standards by major flux networks.

Automated Flux Computation ✓

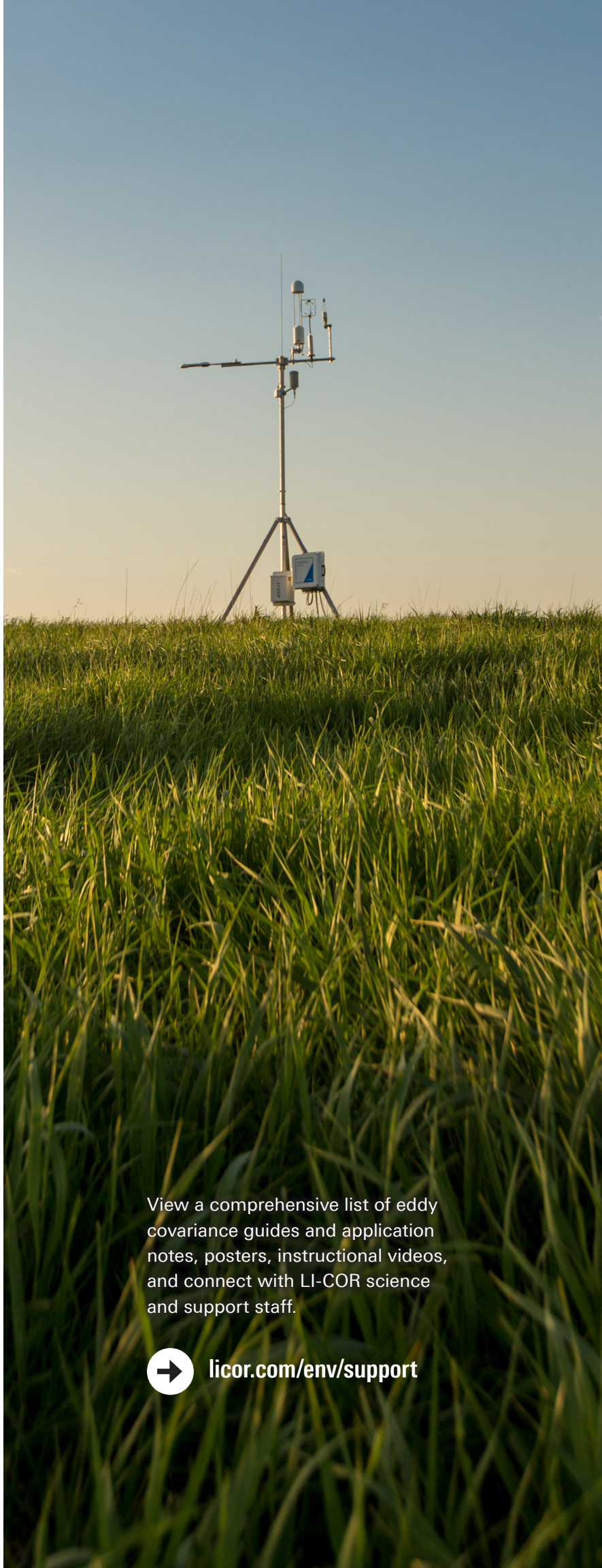
Effortlessly delivered, highly-accurate, fully-processed and corrected flux calculations on-demand with EddyPro® Software. Real time observations and flexible data transfer options with SmartFlux Systems.

Reproducible Post-processing ✓

Powerful, automated post-processing features integrated into an intuitive graphical user interface. Tovi™ Software takes you from your flux data to ecosystem insights and publishable data.

Unmatched Technical Support ✓

Industry-leading technical support from experienced eddy covariance practitioners, on-site education opportunities, webinars, and more.



View a comprehensive list of eddy covariance guides and application notes, posters, instructional videos, and connect with LI-COR science and support staff.



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## Eddy covariance research has changed. And so have the standards for EC systems.

Be on the leading edge of ecosystem gas and energy exchange research with the only eddy covariance systems designed to accommodate breaking technological advancements and meet the changing needs of researchers to provide the highest quality, publishable results.

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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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