AmeriFlux x NEON Workshop
July 9-10, 2024
Lawrence Berkeley National Laboratory, Berkeley, CA

Remote Sensing and Fluxes Upscaling for Real-world Impact

Welcome!

BERKELEY LAB
Bringing Science Solutions to the World

U.S. DEPARTMENT OF ENERGY

AMERIFLUX

NSF | neon Operated by Battelle

CARBON DEW Community of Practice
Fair & Equitable Climate Solutions
Anchored by Direct Atmospheric Measurements

LBNL - The Birthplace of Team Science

In 1931, Ernest O. Lawrence founded Berkeley Lab, pioneering "Team Science"- the foundation for today's national laboratory system.

- **Mission-oriented *science to support critical national goals.***
- **Interdisciplinary teams**
- **State-of-the-art research facilities**

Berkeley Lab Today

Berkeley Lab is one of the world's leading open research institutions.

- Annual budget of ~$1.1 billion
- ~4,000+ staff, including:
  - ~1,700 scientists & engineers
  - ~500 postdocs
  - ~330 grad students
  - ~160 undergrads
- 60+ companies spun off of Lab technologies

Berkeley Lab Today

- **Discovery science; solutions addressing critical energy and environmental challenges.**
- **Managed by the University of California, the Lab represents the most productive relationship between a national lab and university system – 2,000 scientific papers per year, 58% in top journals.**
- **16 Nobel Prizes, 16 National Medals of Science, and 82 members of the National Academies.**

Welcome and Workshop Objectives

Bringing the flux and remote sensing communities together

Promote the integration of remote sensing and flux datafor upscaling ecosystem processes

Identify challenges and opportunities for future development

Welcome and Workshop Objectives

Initiative of the AmeriFlux Year of the Remote Sensing committee and the Flux Upscaling working Group

(Kick-off meeting @ AGU Meeting 2023)

In collaboration with NEON and Carbon Dew

CARBON DEW Community of Practice
Fair & Equitable Climate Solutions
Anchored by Direct Atmospheric Measurements

AMERIFLUX

NSF | neon Operated by Battelle

Organizing Committee

Nicola Falco
(Berkeley Lab)

Stefan Metzger
(AtmoFacts)

David Durden
(NEON)

Chris Florian
(NEON)

Coordinator:
Christin Buechner
(Berkeley Lab)

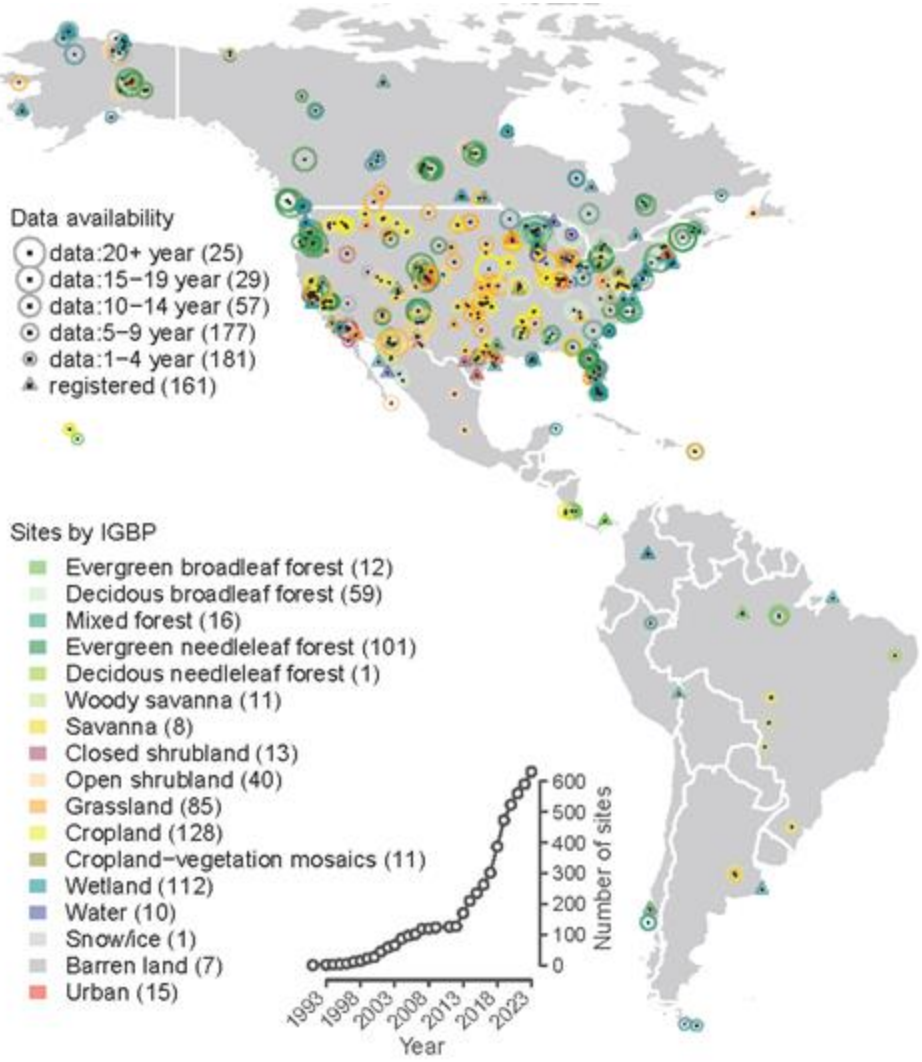
Paul Stoy
(Univ. of Wisconsin-Madison)

Mallory Barnes
(Indiana University)

Gavin McNicol
(Univ. of Illinois Chicago)

Koong Yi
(Berkeley Lab)

AmeriFlux



- **AmeriFlux** is a network of
  - Flux towers
  - Flux datasets
  - Scientists
- Total 665 registered sites; 492 sites offer flux data
- **Non-standardized instrumentation** driven by individual site teams
- **AmeriFlux Management Project (AMP)** provides technical & data support, and facilitates productive scientific community

AmeriFlux Theme Year of Remote Sensing

The goal of the theme year is to encourage research that combines eddy covariance and remote sensing at all levels, from ground to spaceborne, throughout the AmeriFlux community.

- Sessions at conferences

[AGU2024] B102. Surface-Atmosphere Interaction: Intersections between Eddy Covariance and Remote Sensing

- Remote sensing-related Webinar series and Tutorials
- Enhancing AmeriFlux website's capabilities for flux and remote sensing data integration
- Developing Workshops
- Supporting Working Groups

AMERIFLUX

YEAR OF REMOTE SENSING

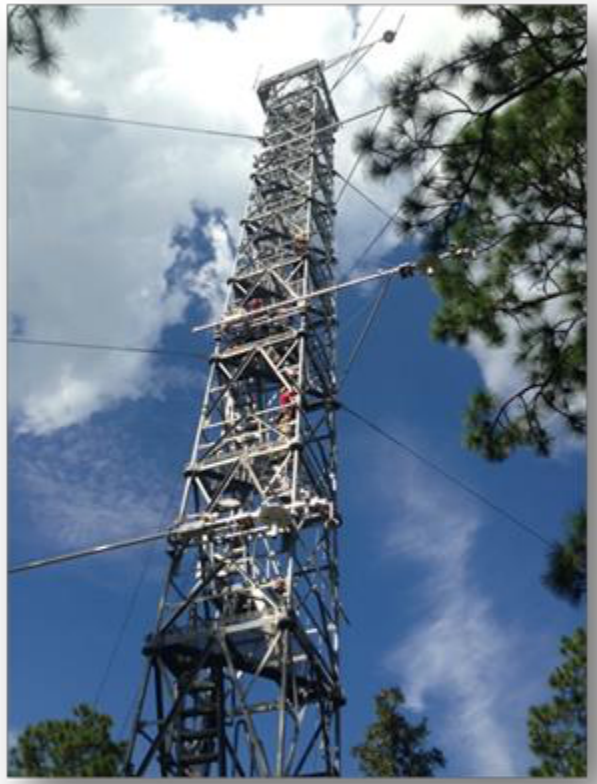
What is the National Ecological Observatory Network (NEON)?

- A US NSF large facility
- A continental-scale observatory
- Designed to enable understanding and forecasting of the effects of climate and environmental change

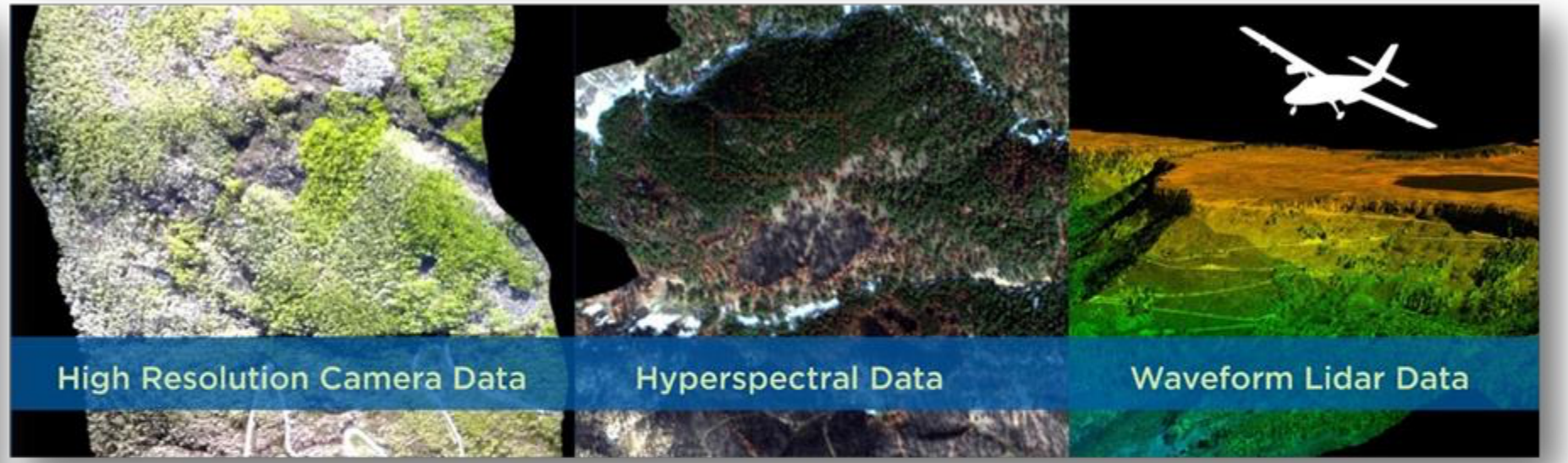
NEON's Linked Collection Systems

Standardized, colocated methods across 81 sites

Airborne remote sensing



Automated instruments

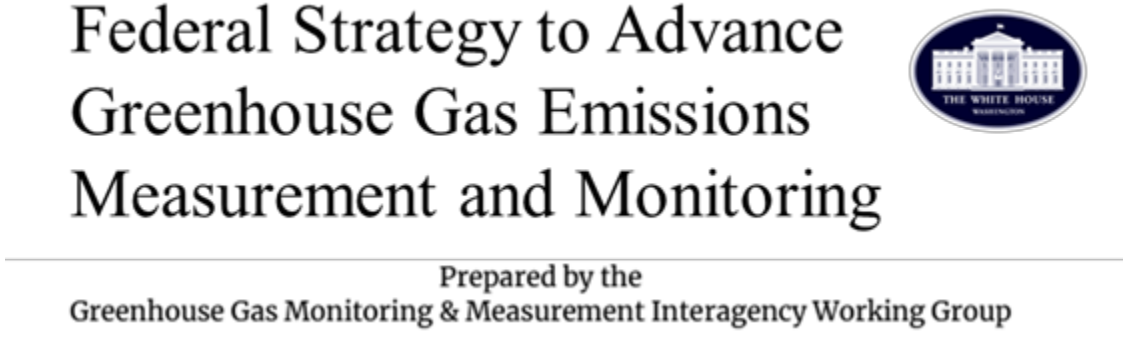


Observational sampling

About the CarbonDew Community of Practice

- **Vision:** Direct measurements of GHG exchange in and out of the atmosphere anchor fair and equitable climate solutions
- **Mission:** Bring together stakeholders across the entire climate spectrum to unlock cross-disciplinary expertise
- Members from over 200 public and private organizations
- Open to join for everyone: www.carbondew.org
- Example activities:

CARBON DEW
Community of Practice
Fair & Equitable Climate Solutions
Anchored by Direct Atmospheric Measurements



Workshop Goals

Review the current state of flux upscaling sciences and discuss techniques for integrating remote sensing data with flux tower measurements

Identify applications and end products, such as precision agriculture, carbon monitoring, and ET mapping

Provide learning experiences, networking opportunities, and understand community needs to shape future working group activities

Facilitate collaborations between research communities and industry sectors, including organizing joint meetings and workshops

Code of Conduct

We convene events and meetings that are welcoming, respectful, inclusive, and collaborative.

Do	Unacceptable behavior
• Be respectful and trustworthy • Be direct but professional • Be inclusive and welcoming • Acknowledge contributions & celebrate achievements • Collaborate and co-create	• Personal attacks • Derogatory language • Disruptive behavior • Harassment • Violence and threats

- Violation may result in being asked to leave an event or online space either temporarily or for the duration.
- If you experience or witness violations of this Code of Conduct, please talk to organizing committee member, or email koongyi@lbl.gov.
- In the case of life-threatening and illegal activities, call 911.

Hybrid meeting format

- Talks and breakout sessions are hybrid.
- Find all zoom links and breakout documents here: ***go.lbl.gov/scalingfluxes***
- All participants will use **Google Doc** to share ideas during the breakout sessions.
- For virtual attendees:
  - Please use the chat for questions and discussion,
  - Or raise your hand during the Q&A session.
  - Chairs will monitor the chat.

Remote Sensing and Fluxes Upscaling for Real-world Impact

Day 1: Tuesday, July 9

Pacific	Eastern	Agenda	Title
8:00	11:00	Welcome, workshop introduction	
		Session 1 - site scale	
9:00	12:00 PM	Keynote: Ankur Desai (University of Wisconsin-Madison)	Your site is not so special, or is it? Scaling fluxes from the specific to the general and back again
9:20	12:20 PM	Science Talk: David Durden (NEON)	From the plot to the plane: NEON's integrated scaled design
9:30	12:30 PM	Impact Talk: Carolina Lisboa (Verra)	Harnessing Remote Sensing and Flux Measurements for Verified Carbon Standard and Agricultural Land Management Methodologies
9:40	12:40 PM	Q&A	
9:50	12:50 PM	Breakout Session 1	
10:30	1:30 PM	BREAK	
		Session 2 - regional/landscape	
11:00	2:00 PM	Keynote: Troy Magney (UC Davis)	Scaling evergreen forest photosynthesis from the needle to the tower to space
11:20	2:20 PM	Science Talk: Housen Chu (LBNL)	Bridge the link between flux towers and models to enable upscaling
11:30	2:30 PM	Impact Talk: Levente Klein (IBM)	Foundation Models for Vegetation Growth and Carbon Sequestration
11:40	2:40 PM	Q&A	
11:50	2:50 PM	Breakout Session 2	
12:30 PM	3:30 PM	Lunch and engagement with speakers	
		Session 3 - global	
1:30 PM	4:30 PM	Keynote: Jacob Nelson & Samuel Upton (MPI BGC)	Reconciling Atmospheric Carbon and Water Fluxes: Integrated Top-Down and Bottom-Up Approaches with FLUXCOM-X and X-BASE
1:50 PM	4:50 PM	Science Talk: Tammy (Kunxiaojia) Yuan (LBNL)	Wetland CH4 Emissions Upscaling by Causality Guided Machine Learning: from Regional to Global Scale
2:00 PM	5:00 PM	Impact Talk: Robert Granat (CarbonSpace)	Flux Estimation Solutions and Impacts in the Food and Beverage Sector
2:10 PM	5:10 PM	Q&A	
2:20 PM	5:20 PM	Breakout Session 3	
3:00 PM	6:00 PM	BREAK	
		Session 4 - integration	
3:30 PM	6:30 PM	Keynote: Youngryel Ryu (Seoul National University)	Beyond Boundaries: The Future of Land Surface Fluxes through Hyper-Resolution Remote Sensing across Space, Time, and Spectrum
3:50 PM	6:50 PM	Science Talk: Stefan Metzger (AtmoFacts)	Linking Realms from Ground to Orbit: Matching Fluxes and States Across Scales
4:00 PM	7:00 PM	Impact Talk: Kevin Tu (Kateri)	Bridging the gap between science and social benefit: Eddy flux for measurement, reporting and verification of grassland carbon sequestration
4:10 PM	7:10 PM	Q&A	
4:20 PM	7:20 PM	Breakout Session 4	
5:00 PM	8:00 PM	Adjourn	

Day 2: Wednesday July 10

Pacific	Eastern	Agenda	Facilitator
8:00	11:00	Arrival and tutorial setup	
9:00	12:00 PM	TOPIC 1: Hands-on tutorial: From site-scale…	Nicola Falco (LBNL), David Durden (NEON)
10:00	1:00 PM	BREAK	
10:15	1:15 PM	TOPIC 2: Hands-on tutorial: … over regional-scale connectivity	David Durden (NEON), Stefan Metzger (CarbonDew)
11:15	2:15 PM	BREAK	
11:30	2:30 PM	TOPIC 3: Hands-on tutorial: … to continental-scale connectivity	Paul Stoy (University of Wisconsin-Madison)
12:30 PM	3:30 PM	Lunch and presentation: tools for data discovery	Margaret Torn (LBNL), Rachel Hollowgrass (LBNL), Bridget Hass (NEON AOP)
1:30 PM	4:30 PM	Report back from Breakouts	Workshop Organizers
2:00 PM	5:00 PM	~~Future workshop topics discussion~~	Workshop Organizers
2:30 PM	5:30 PM	Workshop Summary	Workshop Organizers
3:00 PM	6:00 PM	Adjourn	