Regional updates:
North American Flux Networks

Margaret Torn,
Deb Agarwal, Sebastien Biraud, and AMP Team

Stefan Metzger and NEON team

Kim Novick, Indiana University

June 7, 2017

Fluxnet Workshop, Berkeley, CA

AMERIFLUX

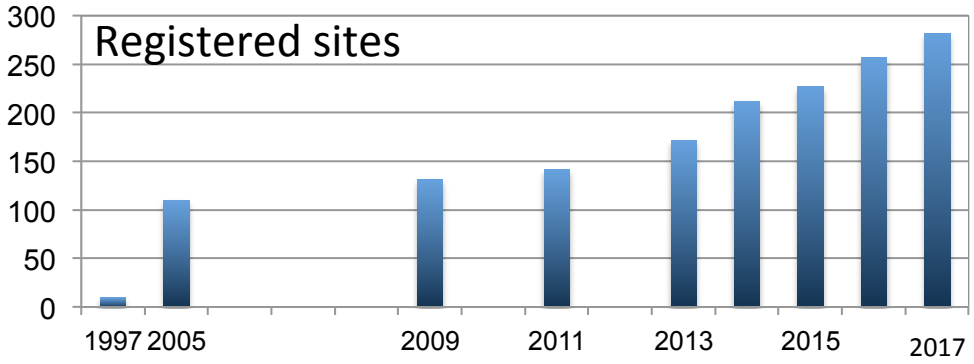
neon
National Ecological Observatory Network

Outline

- AmeriFlux and the AmeriFlux Management Project
- News from AmeriFlux
- National Ecological Observatory Network (NEON)
- NEON-AmeriFlux synergies
- Key challenges for N.A. Networks

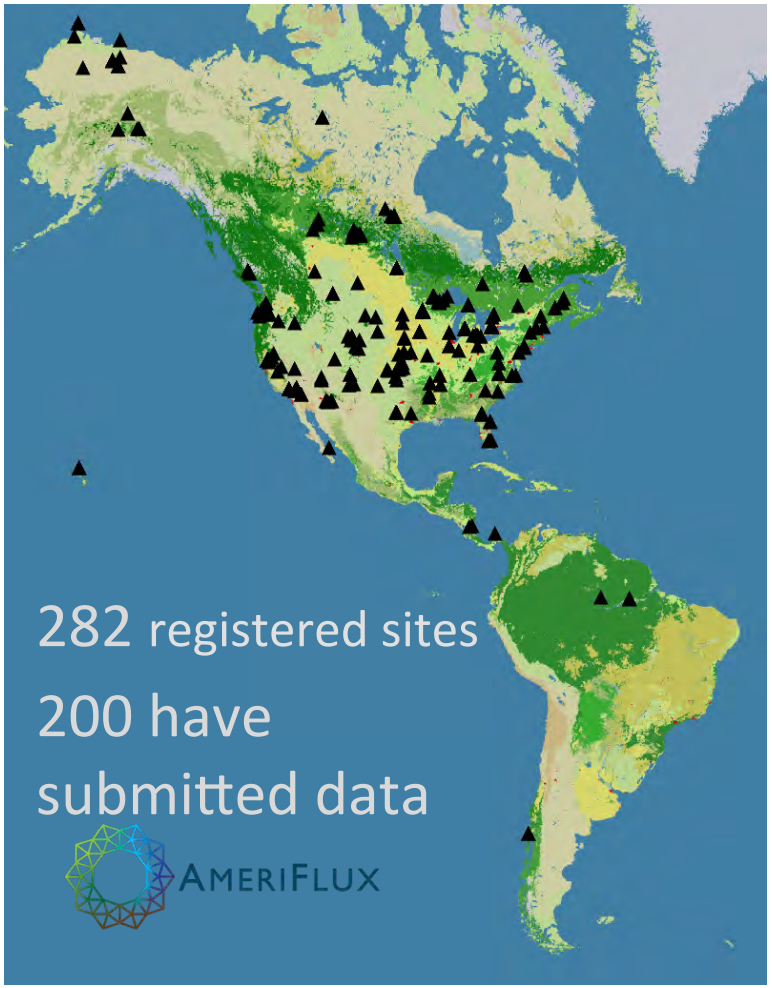
AmeriFlux is a network of sites, data, and scientists

Growing Rapidly



Sites:

Canada	46
USA	222
Mexico	1
Costa Rica	2
Panama	1
Brazil	8
Chile	2



AmeriFlux is a network of scientists

- 500% increase in registered community members in past 2 years
- Community events:
  - Annual Meetings
  - Data-Tech workshops
  - 20th Anniversary events
- A more open data policy
- More data users
- Trainings & outreach

Flux Course

Sites and Scientists

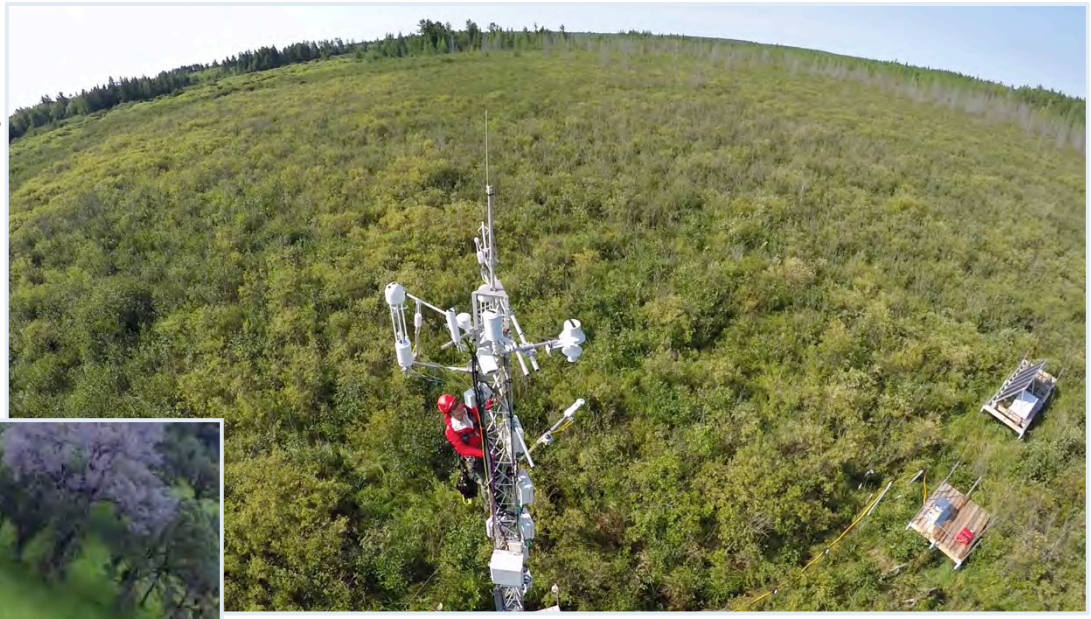
Old growth tropical forest
Alessandro Araujo

AmeriFlux Site PIs: 127

Sites and Scientists

Shrub wetlands

Ankur Desai

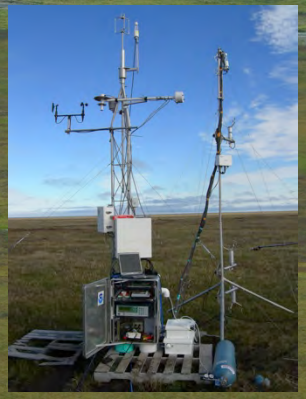


Complex terrain,
Water relations

Dennis Baldocchi

Conditions, Instruments, and Research Vary

Arctic Tundra, Walt Oechel.

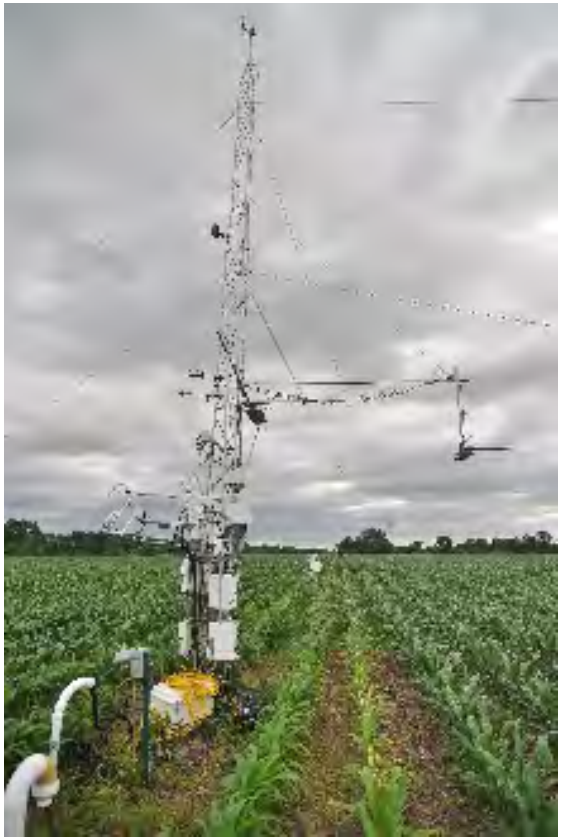


Ivotuk, AK.

Photo: Cathy Wilson

Sites and Scientists

From heavily managed, to old growth, to recently burned



Ag management, N_2O
Rosemount, MN

Subalpine forest
Niwot Ridge, CO

Fire, climate gradient
Valles Caldera Mixed Conifer

Recent highlights

- AmeriFlux 20th Anniversary and EuroFlux 20th Anniversary

  - Special issue of Ag and Forest Met (deadline for submissions is this Friday, June 9)
  - Shared AGU and EGU sessions

- FLUXNET2015: global partnership, great outcome

- Science Steering Committee

Marcy Litvak

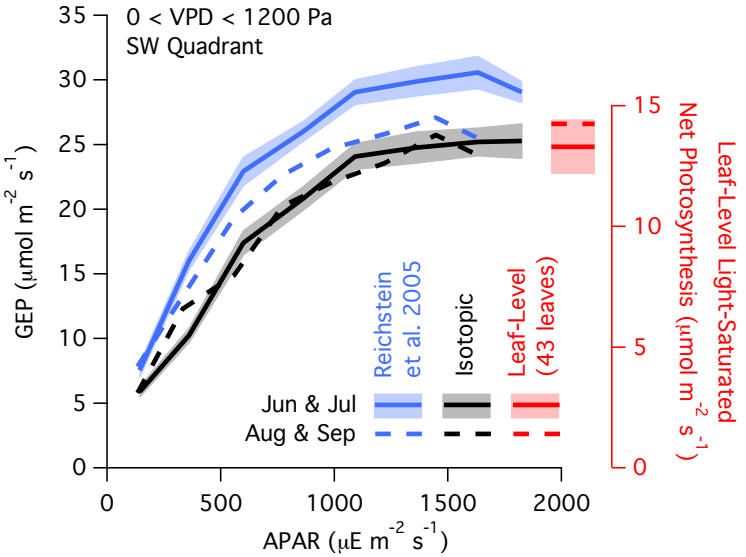
Russ Scott

- NEON coming on line!
  Beginning to affiliate flux sites with AmeriFlux

- Science highlights

Light inhibition of leaf respiration

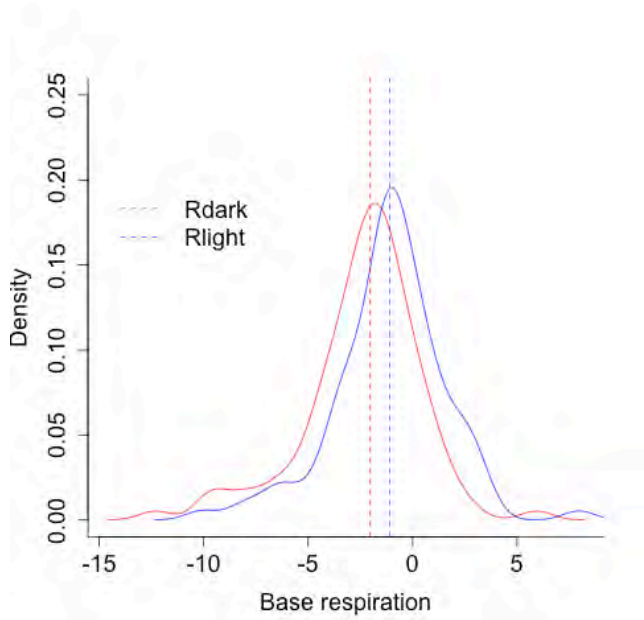
New ^{13}C-flux provides insight into leaf-level process



Harvard Forest, 2011 – 2013

Wehr et al. 2016

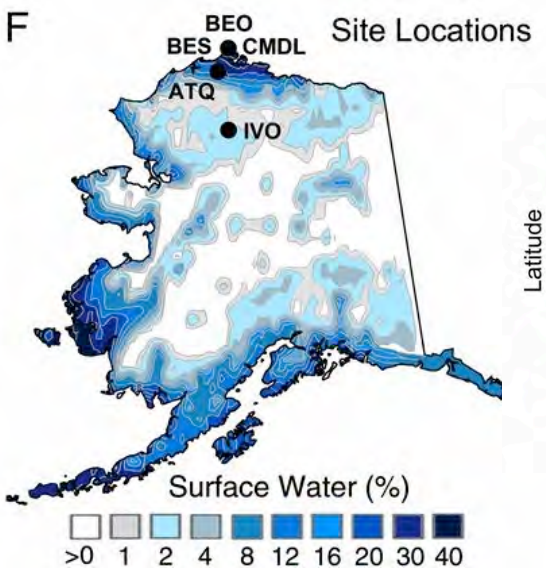
Testing globally using FLUXNET2015

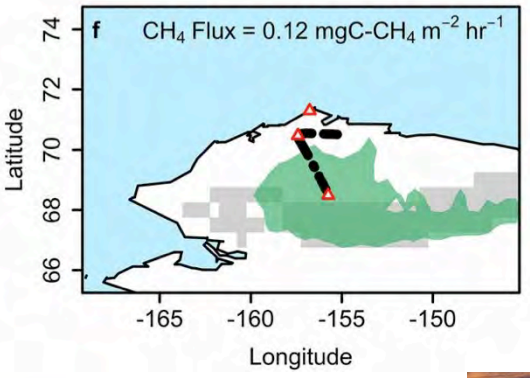


Estimating Kok effect **using changes in the low-light region of the light-response curve**, following approach of Basel Kok. (Keenan, In prep.)

Cold season emissions dominate the Arctic tundra methane budget. Zona et al. 2016.

Cold season fluxes (September to May) account for ≥50% of annual CH_4 flux.

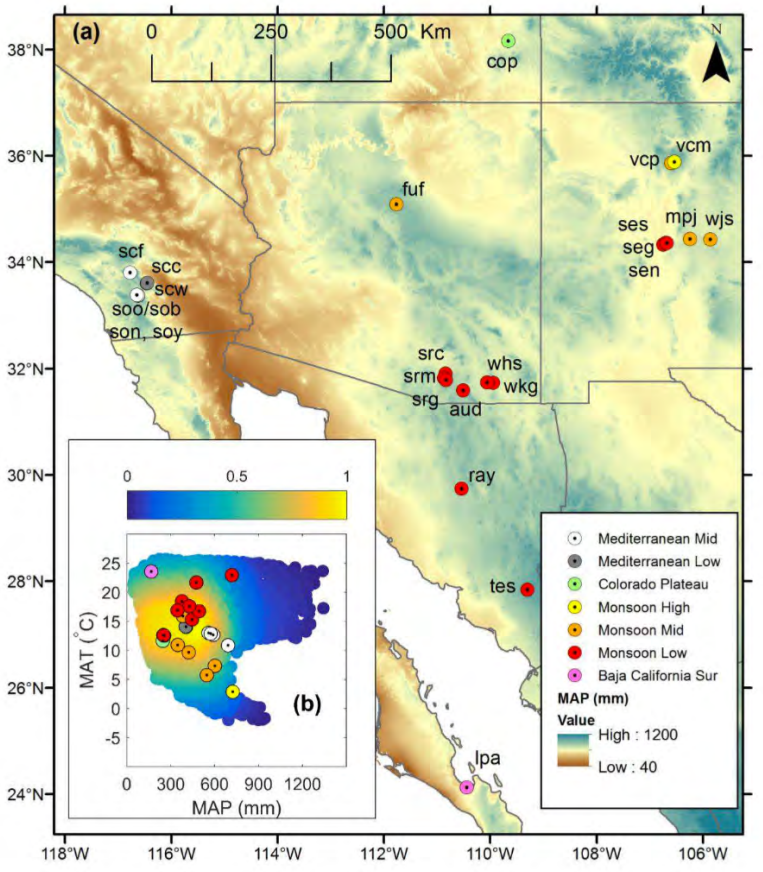




Nov 7, 2014

Dryland CO_2 and ET

- 25 sites in U.S. and Mexico
- Half the sites flipped from C sinks/C sources in wet/dry years.
- Remote sensing-based models only capture 50% of interannual variability

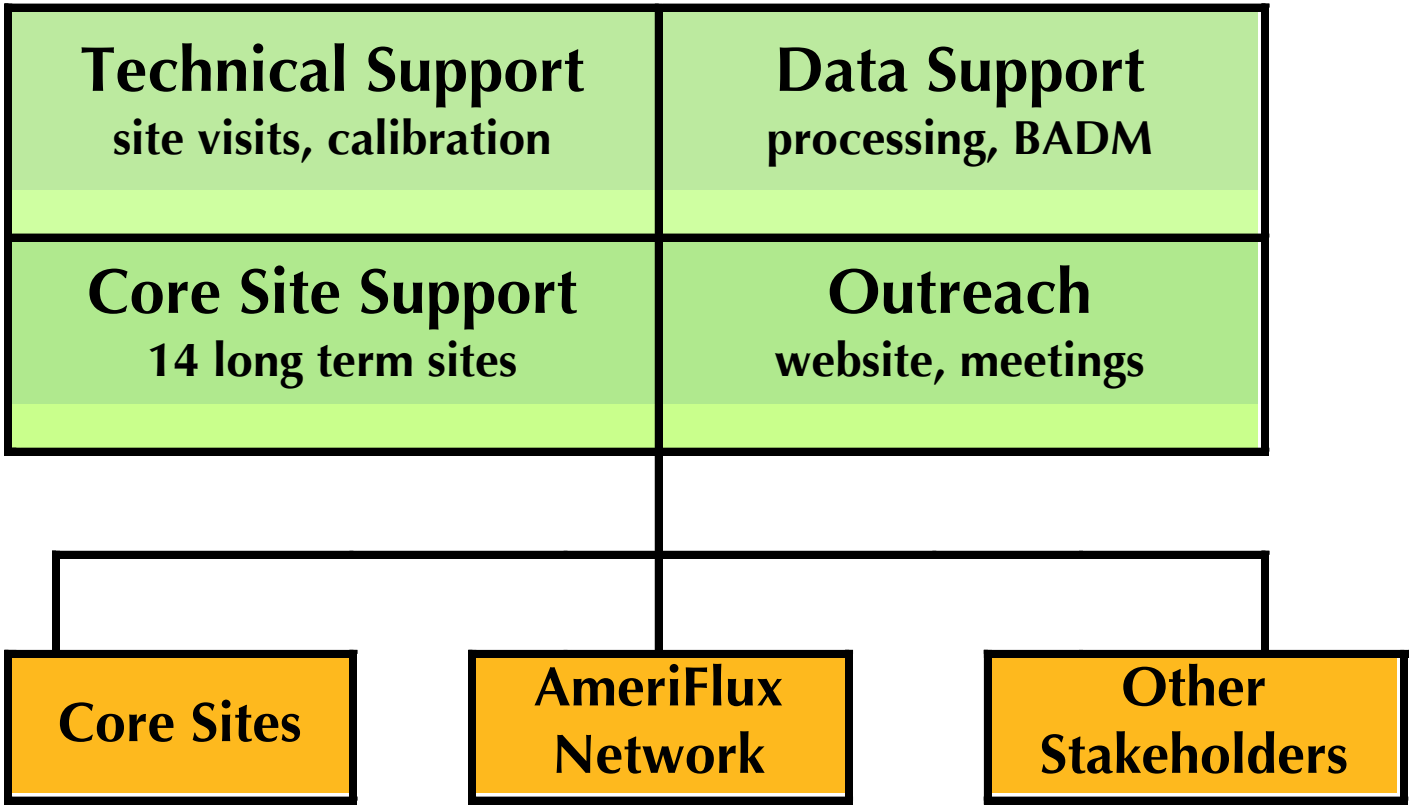


Global Change Biology

CO_2 exchange and evapotranspiration across dryland ecosystems of southwestern North America. Biederman et al. 2017

U.S. DOE established AMP in 2012

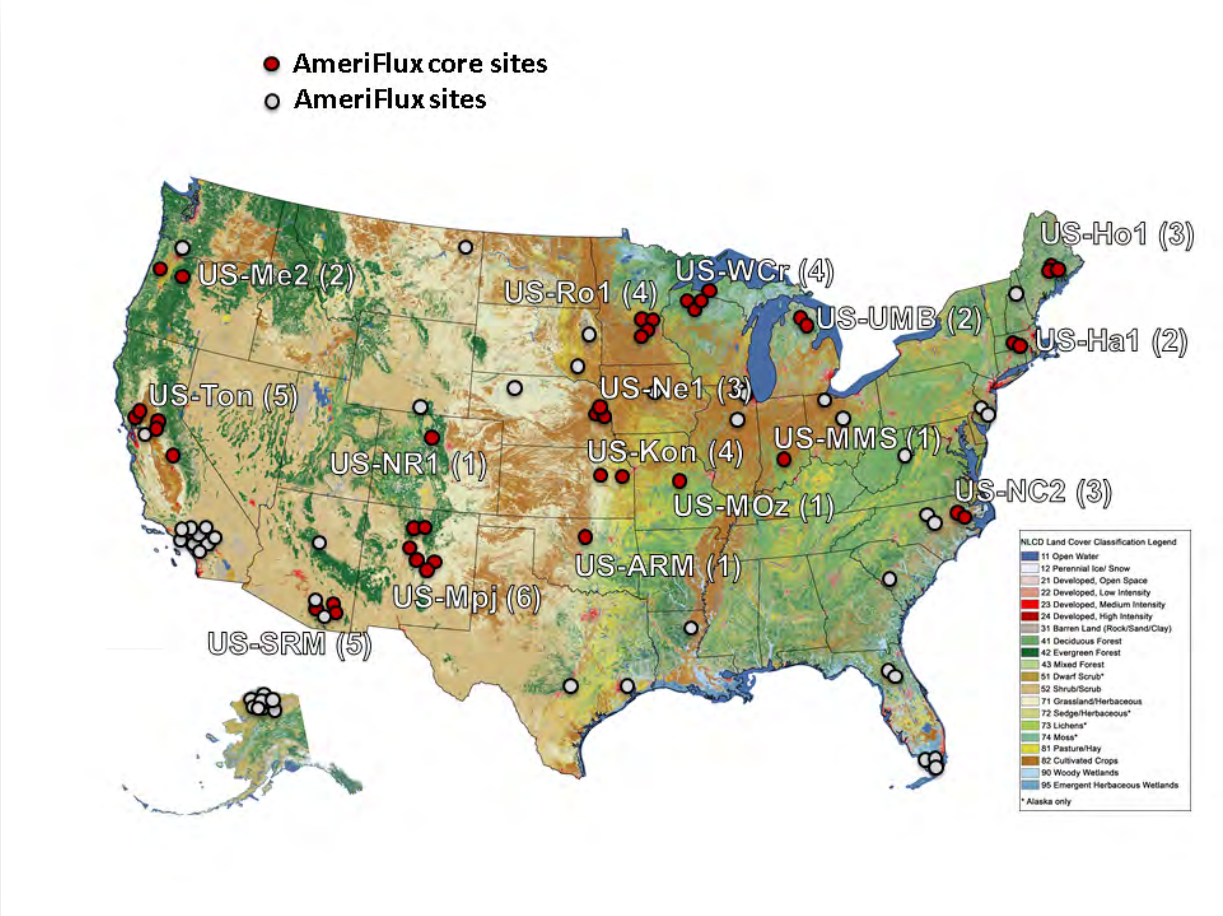
AmeriFlux Management Project



Maintaining long time-series

- Selected long-term sites receiving funding via AMP

- 14 primary core sites
- 14 core-site clusters totaling 47 sites



AMERIFLUX
MANAGEMENT PROJECT

AmeriFlux has 50 sites with data records > 10 years long

Network	# of sites	# of sites sharing flux data via central repository	Average length of flux records (years)	# of sites with 10+ years of flux data
AmeriFlux	282	170	7.2	50
NEON	47	Coming online 2017	<1	0
LTER	25	34 towers from 10 LTER sites	7.8	12
CZO	9 core, >20 affiliated	7	7.2	0

Table 1. Novick et al. 2017, updated
Submitted to Ag & Forest Met AmeriFlux special issue

NEON

- NSF- funded
- 47 replicated facilities

As of June 6, 2017:

- 45 sites: tower structure is erected
- 36 sites: turbulence data streaming.
- 15 sites: verified for initial operations.

NEON Interoperability

Pilot project: global interoperability

Globally interoperable eddy-covariance data products through affiliating NEON sites with AmeriFlux and FLUXNET

- NEON gains participation in a globally harmonized network, improving scientific value and

Authors: Stefan Metzger[1], Deborah Agarwal[2], Se
Papale[3], Gilberto Pastorello[2], Cove Sturtevant[1], M

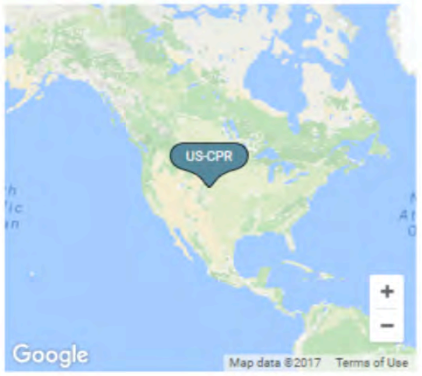
Affiliations: [1] Battelle Ecology, National Ecologic
Lawrence Berkeley National Laboratory, AmeriFlux
of Tuscia, Integrated Carbon Observing System - E

US-CPR: NEON Central Plains Experimental Range (CPER)

Overview | DOI | Data Use Log | Image Gallery | MODIS | Publications | BADM

Tower_team:

PI:	David Durden ddurden@battelleecology.org - NEON
PI:	Stefan Metzger neon-flux@battelleecology.org - NEON
Lat, Long:	40.8155, -104.7456
Elevation(m):	1654
Network Affiliations:	Ameriflux, NEON
Vegetation IGBP:	GRA (Grasslands)
Climate Koeppen:	Bsk (Steppe: warm winter)
Mean Annual Temp (°C):	8.6
Mean Annual Precip. (mm):	320
Flux Species Measured:	CO2, H2O, Isotopes
Years Data Collected:	AmeriFlux: 2016 - Present
Description:	Central Plains Experimental Range (CPER) site in north central Colorado. CPER served as part of the Shortgrass Steppe LTER from 1982-2014 and is now home ... See More
Research Topics:	—
Acknowledgment:	The National Ecological Observatory Network is a project solely funded by the National Science Foundation and managed under cooperative agreement by Battelle.



Site Photo More Site Images

AMERIFLUX

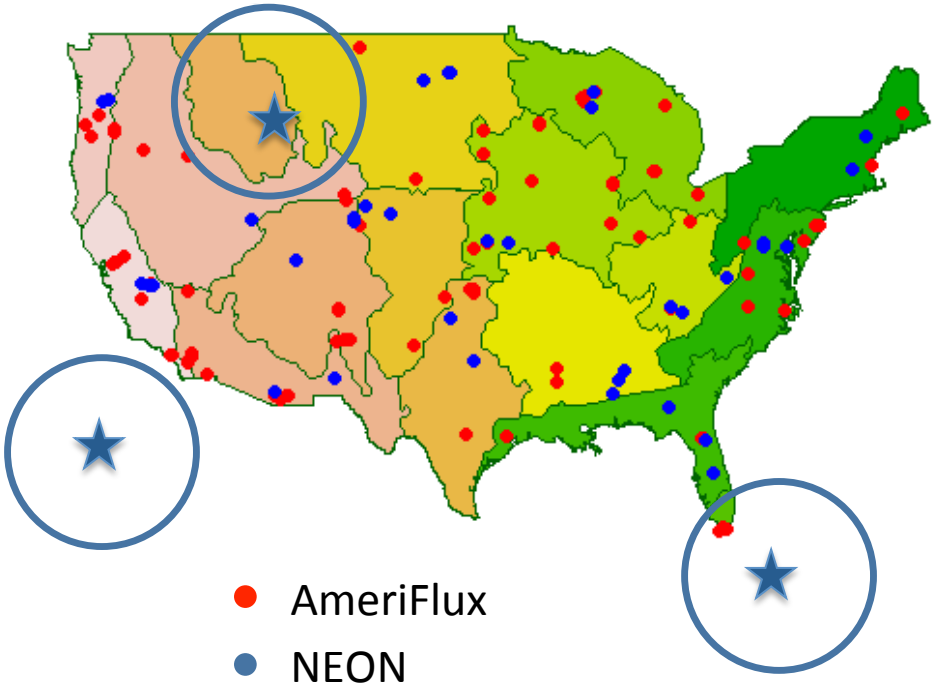
Site Publication More Site Publications

Site Tasks

Add Image | Add Publication | Download Data | Add to Site Set

NEON-AmeriFlux synergies

NEON will improve eco-climatic representativeness



Ecoregions: Hargrove and Hoffman, 1999 & 2004
Credit: David Durden

Sharing and synergies

- ✧ Sites with rich ancillary data
- ✧ Airborne sensing
- ✧ Assignable assets
- ✧ Education resources
- ✧ Software platforms

- ➢ AmeriFlux/FLUXNET data processing
- ➢ Integration with broad user community

U.S. Networks cover wide climate space

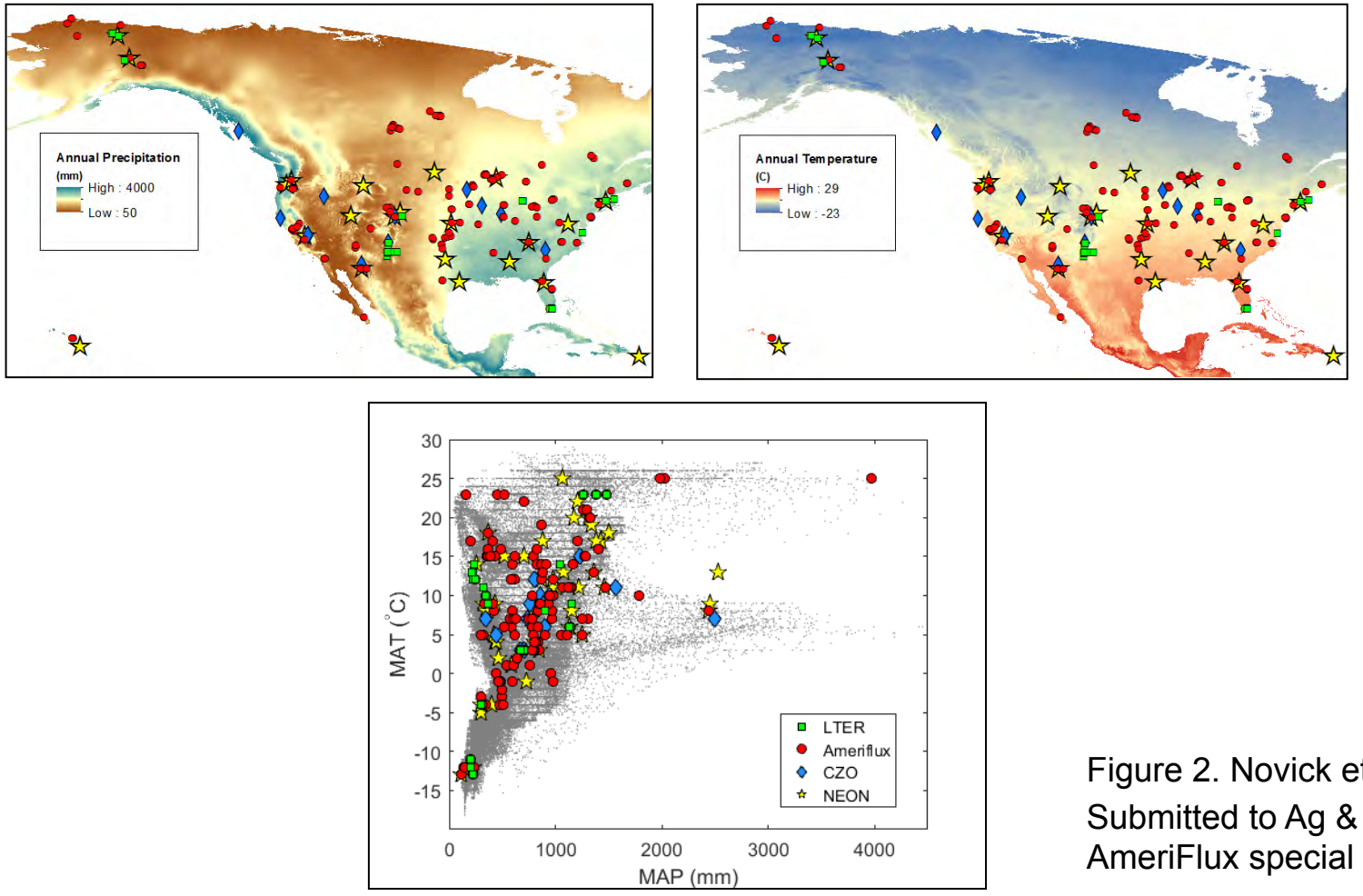


Figure 2. Novick et al. 2017
Submitted to Ag & Forest Met
AmeriFlux special issue

NEON assignable assets
Infrastructure available to community to support our research

- Assignable Assets
  - Airborne Observation Platform
  - Mobile Deployment Platform
  - Sensor/Instrument Infrastructure
  - Observational Sampling Infrastructure
- Field Staff and Site Support

Mobile Deployment Platform (MDP)

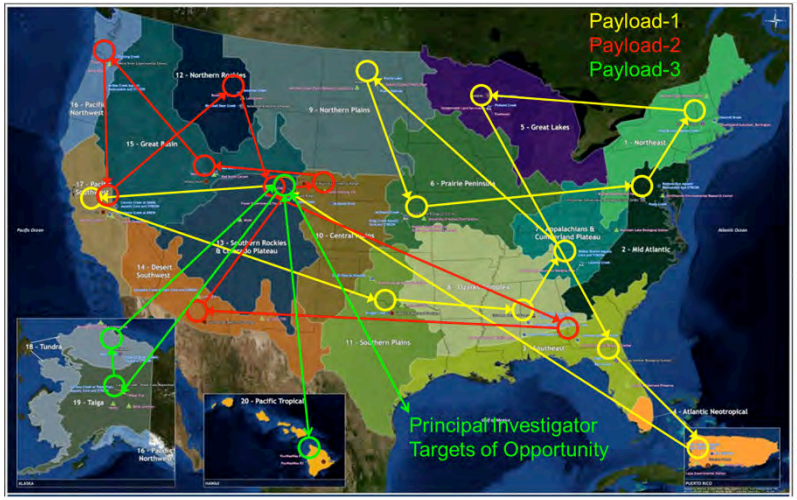
- Self-contained tower, sensors, power, data loggers, instrument hut
- Met, eddy flux, soil, & aquatic Rapid deployment capability
- Five MDPs available for up to 1 year

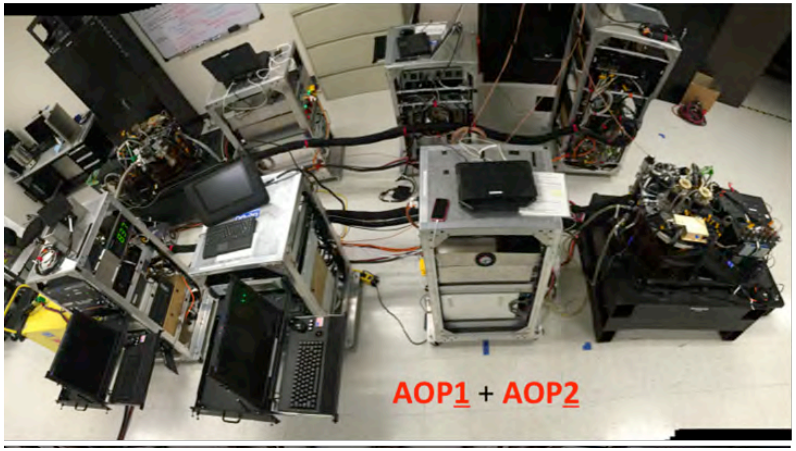
NEON Bioarchive

Credit: David Tazik

For more information
www.neonscience.org/assignable-assets
www.neonscience.org/data-resources/information-for-researchers

NEON airborne remote sensing could provide data for non-NEON sites





collocated
Bartlett Experimental Forest (US-Bar) / BART
Harvard Forest (US-Ha1) / HOPB
Konza Prairie (US-Kon) / KONZ-KING-KONA cluster
Kansas Field Station (US-KSF) / KFS
Niwot Ridge (US-NR1) / NIWO-COMO
Santa Rita Creosote (US-SRC) / SRER
Eight Mile Lake Permafrost (US-EML) / HEAL
Barrow (US-NGB & US-Bes) / BARR
adjacent
Poker Flat Research Range (US-Prr) / CARI-BONA
in vicinity (assignable assets)
Slashpine Austin Cary (US-SP1) / BARC-OSBS-SUGG cluster
Sylvania (US-Syv) / UNDE- CRAM cluster

Some key challenges for North America Networks

- Research funding for synthesis
- Engagement with Latin American flux scientists
- Building in new scientific directions
- Tropical, Arctic, and Wetland sites are under-represented.
- Entraining PIs in big-data approach: adopting standardized formats, contributing to code, sharing data in new ways.
- Getting credit for producing and sharing data: for tenure review, grants, etc.

Thanks to all the Flux Partners!

AMERIFLUX MANAGEMENT PROJECT

FLUXNET A Global Network

ICOS INTEGRATED CARBON OBSERVATION SYSTEM

neon National Ecological Observatory Network, Inc.

USDA

FOREST SERVICE US DEPARTMENT OF AGRICULTURE

NASA

NSF

NOAA

U.S. DEPARTMENT OF THE INTERIOR MARCH 3, 1849

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

CZO, LTER, LTAR, and other flux networks
WMO, NIST, NREL, Phenocam, and more!