

Title: The AmeriFlux Rapid Response System

Biraud C. Biraud,¹ Stephen W. Chan,¹ Marcy Litvak,² Rosvel Bracho,³ Ross Hinkle,⁴ Steve Kannenberg,⁵ Chris Still,⁶ Margaret S. Torn¹

¹Lawrence Berkeley National Laboratory, Berkeley, CA, ²University of New Mexico, Albuquerque, NM, ³University of Florida, Gainesville FL, ⁴University of Central Florida, Orlando, FL, ⁵University of Utah, Salt Lake City, UT, ⁶Oregon State University, Corvallis, OR

Contact: (SCBiraud@lbl.gov)

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Project: AmeriFlux Management Project

Project Website: <http://ameriflux.lbl.gov/>

Project Abstract: Beginning in 2014, the AmeriFlux Management Project has pioneered a program that allows scientists to rapidly initiate ecosystem flux measurements, to take advantage of special research opportunities. Specifically, we maintain and make available loaner flux systems (Rapid Response Systems; RRS) suitable for quick deployment to help scientists capture valuable research opportunities that arise unexpectedly or have limited measurement windows. The RRS is a stand-alone instrument package with a full complement of flux (carbon, water, and energy), meteorological (relative humidity, air temperature, barometric pressure), and radiation sensors (4-component net radiometer, and photosynthetically active radiation). Power and tower infrastructure are not standard components of the RRS and historically have been provided by the RRS requester. Since 2014, AMP has built five RRS and each was immediately in demand. They have been deployed for:

- Ecosystem response to wildfire in northern New Mexico (PI: Marcy Litvak, Sept. 2014–March 2018);
- Plant species composition change in coastal wetlands, Kennedy Space Center, Florida (PI: Ross Hinkle, March 2017–TBD);
- Large-scale irrigation experiment in rice fields, Arkansas (PI: Ben Runkle, May 2019–Nov. 2020);
- Pinyon-juniper recovery following severe drought in southern Utah (PI: Dave Bowling, June 2019–May 2022);
- Post-fire recovery research in a ponderosa pine forest in Oregon (PI: Chris Still, October 2021- September 2024).

The RRS program is successful and we are anticipating the deployment of several RRS in support of synergistic activities across DOE programs: (1) A deployment in August 2022 in support of the SAIL Campaign (Sept. 2021 through June 2023) in the East River Watershed of the Rocky Mountains (<https://sail.lbl.gov/>), where they would be used to improve representation of processes affecting modeling of climate and mountainous hydrology; (2) A deployment along with an upcoming multi-year ARM Mobile Facility campaign in the Southeastern United States in 2023 for five years (SEUS;

<https://arm.gov/capabilities/observatories/amf/locations/seus>). This campaign aims to enhance process understanding and model representations of aerosol, cloud, and land-atmosphere interactions.

To support the growing interest in using the eddy covariance technique in urban environments, the AmeriFlux Management Project has built two additional RRS. These systems (CO₂, H₂O, CH₄, and energy) are similar to previously deployed RRS but are dedicated to deployment in urban environment. These observation packages could support the new BER initiative on Urban Integrated Field Laboratories (Urban IFLs) that will build integrated models and tools to improve our understanding of the links between the natural and human components of the climate system.