THE NATIONAL ECOLOGICAL OBSERVATORY NETWORK:
OVERVIEW AND STRATEGIES FOR RADIATION MEASUREMENTS ACROSS THE CONTINENT

Jeffrey R. Taylor, Ed Ayres, Hongyan Luo, Stefan Metzger, Natchaya Pingintha-Durden, Josh Roberti, Michael SanClements, Derek Smith, Sarah Streett, and Rommel Zulueta

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Grand Challenge Areas

1. Biodiversity
2. Biogeochemical cycles
3. Climate change
4. Ecohydrology
5. Infectious disease
6. Invasive species
7. Land use


NEON Observation Platforms

Aquatic Instruments & Observations

Airborne Observations

Terrestrial Instruments

Terrestrial Observations
National Observatory with 20 Domains

Site Legend:
- NEON Candidate Aquatic
- NEON Candidate Relocatable
- NEON Candidate STREON
- NEON Candidate Core

Chemistry and Ecology

OCEANS
- 20 - Pacific Tropical

Tundra
- 18 - Tundra

Desert Southwest
- 14 - Desert Southwest

Southwestern
- 9 - Northern Plains

Central Plains
- 10 - Central Plains

Southern Rockies & Colorado Plateau
- 13 - Southern Rockies & Colorado Plateau

Northern Rockies
- 12 - Northern Rockies

Great Basin
- 15 - Great Basin

Great Lakes
- 5 - Great Lakes

Northeast
- 1 - Northeast

Mid Atlantic
- 2 - Mid Atlantic

Appalachians & Cumberland Plateau
- 7 - Appalachians & Cumberland Plateau

Prairie Peninsula
- 6 - Prairie Peninsula

Ozarks Complex
- 8 - Ozarks Complex

Southern Plains
- 11 - Southern Plains

Atlantic Neotropical
- 4 - Atlantic Neotropical

Atlantic
- 21 - Atlantic

Atlantic
- 22 - Atlantic

Pacific Northwest
- 16 - Pacific Northwest

Pacific Southwest
- 17 - Pacific Southwest

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Sensors

- Tower and Soil Array at all 60 sites
- 37 Instrument Assemblies
- Over 2000 measurements per core site at frequencies of daily, and ~0.1 to 40 Hz
  - Meteorology
  - Radiation
  - Atmospheric Chemistry and Air Quality
  - Dust and Aerosols
  - Fluxes of CO2, H2O, and Energy
  - Soil Measurements
Radiation Measurements

• Radiation measurements standard at every site:
  • PAR
  • Net Radiometer
  • Direct & Diffuse Pyranometer
  • Primary Pyranometer
  • Camera Imagery
  • Sunphoto Spectrometers
• Aircraft camera images as well as LIDAR and hyperspectral imaging data products
• Citizen Science Synthesis
Terrestrial NEON Site Schematic
Tower Measurements

AERIAL VIEW

FLUX SCALE IS A FUNCTION OF:
1. Atmospheric Stability
2. Wind Direction
3. Wind Speed
4. Surface Roughness

FLUX SCALE
(from 60 m to 200 m - 1000 m)

LOCAL/MICROCLIMATE SCALE
(from tower to 60 m)

SOIL SCALE
(from 40 m to 100 m - 200 m)

INCIDENT/SYNOPTIC SCALE

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Images of NEON sites
Photosynthetically Active Radiation

Li-Cor Li-191 Quantum Line Sensor: soil plots

Kipp & Zonen PQS1: tower profile and aquatic sites (400-700 nm)
Net Radiometer

Hukseflux NR01: tower top and soil plots (285-3000 nm and 4.5-40 μm)
Pyranometers

Kipp & Zonen CMP22: Primary Pyranometer ISO Standard (200 to 3600 nm)

Dynamax SPN1: Direct & Diffuse Pyranometer (400-2700 nm)
Sunphoto Spectrometer

Cimel CE-318N: Scattering and AOD (340-1640 nm bands)
Phenology Cameras

StarDot NetCam SC: 1280 x 960
Calibration and Validation
Airborne Observing Platform

• Aircraft with specially mounted instrumentation will fly routine patterns over all NEON sites and surrounding areas (~300km² range) approximately once per year to collect detailed aerial data about the regional landscape and vegetation.

• Each site fly-over will last approximately four hours, with planes flying at an altitude between three and five thousand feet. All flights will be coordinated with the site host.
**Integrated Radiation Measurements**

### What are we after?

- Detailed chemical, structural and taxonomic information on ecosystems at fine spatial resolution

- Sampling at the scale of individual organisms (~1m) over 100’s of sq. meters around NEON sites

- Bridge the scales from organisms (i.e., trees or shrubs) as captured by plot sampling, to stand scale observations as measured from flux towers, to the scale of satellite based remote sensing
## Preliminary Data!!

**Level 1 Data Product**

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jtaylor@neoninc.org