

PROPOSAL FOR FLUXNET SYNTHESIS PUBLICATION



**Initial coordinators:
Collaborators
needing access to
data:**

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TITLE OF PAPER AND OUTLINE

Exploring relationships among carbon exchange, foliar nitrogen, and canopy albedo at global scales

The availability of nitrogen represents a key constraint on carbon cycling in terrestrial ecosystems and it is in this capacity that the role of nitrogen in the Earth's climate system has been considered. Despite this, few studies have included continuous variation in plant N status as a driver of broad-scale carbon cycle analyses. This is partly due to uncertainties in how leaf-level physiological relationships scale to whole ecosystems and because methods for regional to continental detection of plant N concentrations have yet to be developed. In recent work (Ollinger et al., in review), we have shown, using data from a dozen temperate forest sites across the United States (29°N-46°N), that that ecosystem CO₂ uptake capacity scales directly with whole-canopy nitrogen concentrations, mirroring a leaf-level trend that has been observed for woody plants worldwide. We have also demonstrated that both CO₂ uptake capacity and canopy nitrogen concentration are strongly and positively correlated with shortwave surface albedo. These results suggest that nitrogen plays an additional, and previously overlooked, role in the climate system via its influence on vegetation reflectivity and shortwave surface energy exchange.

We propose to expand on this work by exploring the generality of carbon-nitrogen-albedo relationships over a wider range of ecosystems using flux and radiometric measurements, as well as ancillary canopy-level data, from the FLUXNET "La Thuile" database. We will estimate canopy photosynthetic capacity (A_{max} for a hyperbolic light response function, as well as J_{max} and V_{cmax} parameters from the Farquhar model) from the CO₂ flux and site meteorological data, calculate canopy albedo from radiometric measurements, and link these to canopy N and LAI and also MODIS albedo for the tower cut-out. We will test whether relationships among these variables differ among plant functional types (e.g., IGBP vegetation class), or climate classifications.

PROPOSED SITES TO BE INVOLVED

All sites for which one year of half-hourly measurements of incident and reflected global radiation (R_g and R_r) is available will be considered for inclusion, as will all sites that have contributed foliar N and canopy LAI estimates to the ancillary database.

CO-AUTHORSHIP POLICY

Contributors providing intellectual input will be included as named coauthors; all data providers will be invited to contribute in this way. Data providers choosing not to make an intellectual contribution will be included as group coauthors in the author list, i.e., "and the FLUXNET Data Providers", and identified by name in the Acknowledgements.