

## PROPOSAL FOR FLUXNET SYNTHESIS PUBLICATION



### Initial

### coordinators::

Mirco Migliavacca, Markus Reichstein

### Collaborators

### needing

### access to

### data:

Marion Schrumpf, Josep Penuelas, Ivan Janssens, Marcos Fernandez, Jens Kattge, Miguel D. Mahecha, Talie Musavi, Jordi Sardans, Sara Vicca, Marjan van de Weg, Sönke Zaehle

Max Plank Institute for Biogeochemistry

Antwerp University

CREAF - Universitat Autònoma de Barcelona

Amsterdam Global Change Institute

### Affiliations:

Vrije Universiteit

## DATASET PROPOSED

LaThuile

## TITLE OF PAPER AND OUTLINE

### **The impact of nutrient limitation on carbon and water fluxes (Nitrogen vs Phosphorous).**

Human-induced CO<sub>2</sub> and nitrogen (N) fertilization are increasing. Conversely, anthropogenic inputs of phosphorous (P) are increasing at a lower rate, hence, generating a strong imbalance with P in land ecosystems.

As recently shown in the literature (e.g. Peñuelas et al., 2012), this imbalance confers an important role to P availability and leads to shifts in C-N-P ratios and balances. As a consequence, Sardans and Penuelas, (2012) suggested a potential significant impact on the structures and functions of ecosystems, through effects on growth rates and on the competitive abilities of different species.

The effects of P limitation might be also exacerbated, first, in tropical rainforests, where N and, especially, P are limiting; and, second, in water-limited ecosystems (for a review Sardans and Penuelas, 2012) with a synergic effect of increasing droughts and nutrients shortage that might impacts both ecosystem functioning and structure.

In the literature there are many studies on the effects of N availability on ecosystem functioning, while much less is known about the effects of P-limitations.

The main objectives of this study are *i)* to improve our understanding of ecosystem-level flux responses to different C:N:P leaves stoichiometry and to different degrees of nutrient limitation, and *ii)* to serve as backbone for the implementation of P-cycle into the state-of-the-art terrestrial biosphere models.

Specifically, we aim at analyzing if and how carbon and water fluxes, their

relationship with climate variables, as well as, where possible, carbon use efficiency differ *i*) in N-limited and P-limited ecosystems, and *ii*) with respect to different degrees of nutrient limitation within different climate zones or plant-functional types.

Moreover, in specific sites, we also aim at analyzing differences in the recovery of ecosystem's functioning and biomass production to weather anomalies (such as drought) related to difference in nutrient availability and/or soil and plant stoichiometry.

The analysis might be further extended to other nutrient (i.e. K, Mg, and Ca).

Because of the lack of standardize information on nutrient available for plants into soils and plant stoichiometry, targeted field campaigns might be planned and carried out at selected FLUXNET sites. Moreover, we expect to overcome this lack of information combining field measurements with the plant trait database (TRY, Kattge et al. 2011).

## References

Kattge, J., et al., (2011) TRY - a global database of plant traits. *Global Change Biology* 17, 2905-2935.

Peñuelas J, Sardans J, Rivas-Ubach A, Janssens (2012) The human-induced imbalance between C, N and P in Earth's life system. *Global Change Biology*, 18, 3-6.

Sardans J, Peñuelas J (2012) The C:N:P stoichiometry of organisms and ecosystems in a changing world: A review and perspectives. *Perspectives in Plant Ecology, Evolution and Systematics*, 14, 33-47.

## PROPOSED SITES TO BE INVOLVED

All sites in the LaThuile dataset will be considered for this project. Sites will need to represent different vegetation types, environmental conditions and climate regions. Long-term sites will be preferred to sites with only few years of data.

### Data required

- Ecosystem fluxes of energy, water and carbon
- Climate characteristics
- Soil characteristics (possibly extended with specific field campaigns)
- NPP where available
- Vegetation characteristics (LAI, C:N:P stoichiometry in the main pools)

## PROPOSED RULES FOR CO-AUTHORSHIP

According to the La Thuile FLUXNET data policy, co-authorship will be offered to PIs for contributions that significantly change the paper. Acknowledgment and citation of the PI's work is implied automatically.