PROPOSAL FOR FLUXNET SYNTHESIS PUBLICATION

Initial coordinators: Jens Kattge[1], Markus Reichstein[1]

Collaborators needing access to data: Talie Sadat Musavi[1], Franziska Schrodt[1,2]

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DATASET PROPOSED

LaThuile

TITLE OF PAPER AND OUTLINE

TITLE: Contribution of plant traits to ecosystem functions as observed by eddy covariance measurements

CONTEXT: This is a proposal in the context of the project: 'Transformational Steps In Synthesis Science', funded by the University of Minnesota and the Max Planck Institute for Biogeochemistry.

SYNERGY WITH ONGOING ACTIVITIES: This proposal is a companion proposal to the ongoing proposal: 'Can plant traits be used to scale ecosystem carbon and water fluxes?' submitted by Martine Janet van de Weg, Han Dolman and Peter van Bodegom.

OUTLINE: Ecosystem fluxes of carbon, water and energy are determined by ecosystem functional properties and modulated by the current variation of radiation, temperature, water availability and vegetation state. While ecosystem functional properties, like the functional dependencies of GPP and TER on environmental variables, which can be summarized as (inherent) water-use efficiency, radiation-use efficiency, A/g or dFlux/dClimate at standardized conditions, typically vary on long timescales, from annual to decadal or longer, the current conditions of temperature, water availability and vegetation state typically vary on instantaneous, diurnal or annual timescales.

Recent analyses of the FLUXNET dataset have shown that much of the observed spatial and temporal variation of ecosystem fluxes can be explained and scaled by information on soil, climate and vegetation structure, without considering the characteristics of the individual plants occurring at the FLUXNET sites (e.g. Jung et al. 2010, Beer et al. 2010, Mahecha et al. 2010). This is – for current conditions - not a surprise, considering species selection and adaptation of individual plants. However in the face of climate change this may become different, if environmental conditions change more rapidly than species selection and/or plant adaptation.

The aim of this study is to identify the contribution of plant traits to ecosystem

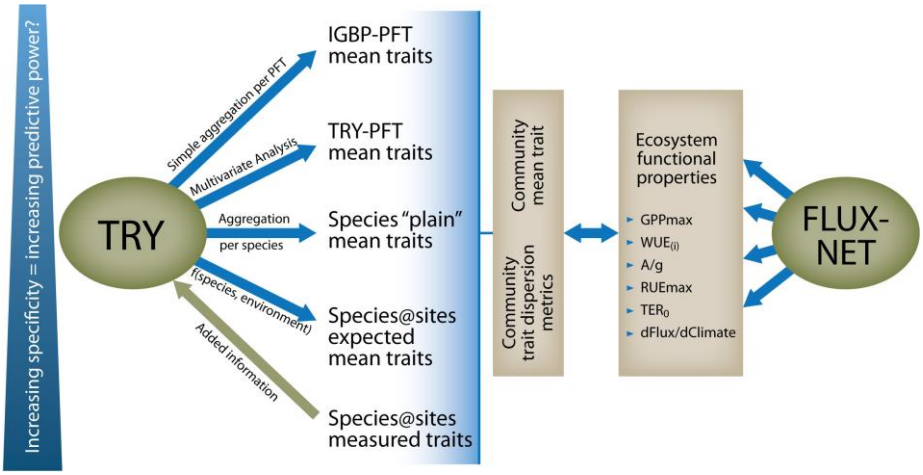
functional properties, which is currently hidden by – 'perfect' - selection of species and adaptation of individual plants. We attempt to do this by identifying the correlation structure between relevant ecosystem functional properties, soil, climate, vegetation and the multivariate spectrum of plant traits (e.g. Wright et al. 2004). This correlation structure may provide the basis for an assessment of vegetation functioning under rapid climate change.

Methods

We will analyze the correlation structure in the data-matrix of relevant ecosystem functional properties, characteristics of climate, soil and vegetation, and plant traits on large spatial scales, starting at FLUXNET sites, aiming at spatial interpolation.

So far such analyses were impossible due to lack of plant trait information. We expect that this lack of plant trait information will be overcome by the combination of measurements of plant traits at FLUXNET sites, the development of a joint plant trait database (TRY, Kattge et al. 2011) and new methods for statistical interpolation of the plant trait matrix (Shan et al. 2012).

By analyzing plant trait information on the individual, species and PFT level we will be able to identify their specific contributions.



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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.

Data required

- Ecosystem fluxes of energy, water and carbon
- Climate characteristics
- Soil characteristics
- Vegetation characteristics (LAI and species abundance, at least the dominant species)
- Plant traits (for at least the dominant species)

PROPOSED RULES FOR CO-AUTHORSHIP

La Thuile FLUXNET data policy will be applied.

CVs:

Jens Kattge

2010-ongoing Scientist at the MPI for Biogeochemistry, Jena, DE

2005-2010 Scientist at the MPI for Biogeochemistry, Jena, DE; Independent Junior Research Group "Organismic Biogeochemistry" headed by Christian Wirth

2002-2005 Project Scientist at the MPI for Biogeochemistry, Jena, DE; 'CAMELS Carbon Assimilation and Modeling of the European Land-Surface' PI: Wolfgang Knorr

2002 PhD in Plant Biology at the University of Giessen, DE, 'Nitrogen limitation of the CO2 fertilization effect' supervised by Gerd Esser

Markus Reichstein (known at FLUXNET)

Franziska Schrodt

2011-ongoing Project Scientist at University of Minnesota, Minneapolis/StPaul, USA and MPI Biogeochemistry, Jena, DE; 'Transformative Steps in Plant Data Synthesis' PI: Peter Reich, Markus Reichstein

2006-2011 PhD in Tropical Biogeochemistry, University of Leeds, UK 'Multi-continental biogeochemical comparisons of the Forest-Savanna transition' Supervisors: Jon Lloyd, Robert Mortimer, Simon Lewis

2004-2005 MSc in Biological Diversity, University of Plymouth, UK 'Habitat preferences of duiker in the Arabuko-Sokoke Forest Reserve, Kenya: Implications for the conservation of Aders' duiker (Cephalophus adersi).' Supervisor: Eirene Williams

2002-2004 BSc in Biotechnology, University of Applied Sciences Mannheim, DE 'Optimization of pharmaceutical quality of herbal extracts and mother tinctures by means of phytochemical and pharmacological techniques instancing Deadly Nightshade (Atropa bella-donna)'. Supervisor: R. Stenzel

Talie Sadat Musavi

2011-ongoing PhD 'Contribution of plant traits to ecosystem functions' at MPI Biogeochemistry, Jena (DE) Supervisors: Markus Reichstein, Jens Kattge, Christian Wirth

2007-2010 MSc in Plant Systematic and Ecology, Shiraz University, Department of Biology, College of Sciences, Shiraz, Iran. Total GPA: 18.41/20 (With dissertation)

2002-2006 BSc in Plant Biology, Azad University of Gorgan, Gorgan, Iran. Total GPA: 17.17/20