PROPOSAL FOR FLUXNET SYNTHESIS PUBLICATION

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TITLE OF PAPER AND OUTLINE

Identifying environmental and biophysical controls of monthly carbon and water fluxes

In this study we aim to identify the main environmental (meteorology/climate, soil hydrology) and vegetation structural factors (fraction of absorbed photosynthetic active radiation, vegetation type) that can explain the variability of biogeochemical fluxes across time and space on monthly time scale. Recent studies imply that the between site variability of GPP as well as its seasonal course can be described by environmental factors and/or remotely sensed biophysical parameters of vegetation structure (e.g. Reichstein et al, 2007; Jung et al, 2008, Sims et al. ,2006a, Sims et al. ,2006b, van Dijk et al, 2003) suggesting redundancy of some variables. We use the remote sensing FAPAR product of Gobron et al (2006) in conjunction with environmental variables measured at the sites and aim at understanding the relative importance of different controls to guide the development of as simple as possible statistical models that can be used for the up-scaling of monthly fluxes. In the context of up-scaling it is important to consider the availability and uncertainty of global forcing fields (e.g. meteorological data, soil hydrological condition, e.g. Jung et al, 2007, Zhao et al, 2006). Hence, it is sensible to understand to what extent these problematic variables can be replaced by others with less additional uncertainty when applying models to continents and the globe. Our study delivers a series of empirical models for different input data requirements and an assessment of their individual limitations and can build one basis for globally up-scaled flux estimates and their variability such as proposed by Papale et al. and Reichstein et al.

The analysis is based on a newly developed regression-based algorithm that hierarchically partitions the data (Jung & Reichstein, unpublished/in prep; cf. Vens & Blockeel 2006). The algorithm minimizes the error of a regression model by recursive partioning of the data set according to explanatory variables to yield a series of regression sub-models, each being valid for certain conditions. Essentially the algorithm identifies the best rules for splitting the data set into sub-spaces and the variables that are most suitable for prediction in these sub-spaces. This explorative approach reveals structure in the data set, which provides insights what controls the variability of biogeochemical fluxes under which conditions. Methods are available that allow assessing the importance of individual explanatory variables facilitating to estimate the gain or loss of information by including/excluding explanatory variables.

PROPOSED SITES TO BE INVOLVED

The sites will cover a broad variety of climates and vegetation types. Sites will be selected according to minimum requirements regarding data quality, allow meaningful parameter estimation. Availability of NEE, GPP, ET and meteorological data is required.

PROPOSED RULES FOR CO-AUTHORSHIP

The rules of the FLUXNET synthesis terms of reference apply, i.e. additional significant intellectual input leads to co-authorship in this paper.

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