

## PROPOSAL FOR FLUXNET SYNTHESIS PUBLICATION



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### DATASET PROPOSED

LaThuile, Opened, FairUse

### TITLE OF PAPER AND OUTLINE

#### Effects of hydrometeorological extremes on land-atmosphere fluxes

The aim of this study is to systematically evaluate the impact of extreme climatic events on ecosystem-atmosphere fluxes across the observations in FLUXNET. In particular, we seek to quantitatively address the following questions:

- What is the fraction of climate extremes that effectively lead to extreme ecosystem responses?
- When do we observe ecosystems switching from a CO<sub>2</sub> sink under "normal conditions" to a CO<sub>2</sub> source under "extreme conditions"? Here, we work from the hypothesis that climatic extremes that include water scarcity imply a decrease in GPP. However, we have no a priori knowledge how Reco responds in different PFTs and climate zones, rendering a global prediction on NEE very difficult.
- What are the effects of the duration of the climatic extremes on the uptake, efflux, and net fluxes of CO<sub>2</sub> and H<sub>2</sub>O? Our initial assumption is that the length of climatic extremes has pronounced effects on GPP, and later on Reco. Hence, it is thinkable that we cannot identify an effect in NEE for very long extremes. However, likewise very short extremes may not result in measurable effects on NEE. Hence, we hypothesize that the strongest on the local C-balances originate from extremes of intermediate duration.
- How do different plant functional types differ in their reactions to climatic extremes? What are major environmental controls explaining potential differences in the responses of extremes to climatic extremes?
- What is the total net effect of climate extremes across FLUXNET?

Our analysis strategy is as follows:

We classify different types of extremes: For instance,

- Extremes in anomalies of daily minimum temperatures during the growing season,
- Extreme daily maximum temperatures at non extreme soil water levels during the growing season,
- Water scarcity at non extreme temperatures during the growing season,
- Coinciding extremes in high temperatures and low water levels,

amongst others. We use downscaled meteorological data (specifically created for each site) that allow us to use a consistent reference time horizon for each site and may help avoiding artifacts due to the different length of monitoring at each site.

After the extremes have been identified, we estimate the impacts on the flux observations in both absolute and relative terms.

### **PROPOSED SITES TO BE INVOLVED**

All sites containing at least 2 (or 3) full years of continuous flux and meteorological data and experienced a (hydro-)meteorological extreme in a common 22 years horizon maybe considered for this analysis.

### **PROPOSED RULES FOR CO-AUTHORSHIP**

All data providers of the sites that will be used will be invited to give intellectual input. Significant intellectual input leads to co-authorship – for details see data policy.

CVs of the initial coordinators are submitted in a separate file.