Inter- & intraannual variability of CO_2 fluxes of temperate ecosystems at a global scale

Proposing core group:
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Co-author policy: Data providers and researchers from within the Fluxnet community who are interested in this topic will be invited to contribute. A first draft manuscript will be prepared and circulated among those who showed interest. Intellectual input concerning the draft manuscript will result in co-authorship.

Sites: temperate forests, wetlands and natural grasslands (right now, no croplands) with complete annual flux data sets (in La Thuille, we counted 101 site with more than 360 site years) (at least 80 % of the daily half-hourly measurements are original observations) and auxiliary data such as species composition, LAI measurements over the years, soil characteristics, ….)

Outline/Objectives: Based on the discussions in La Thuille and subsequent emails, we would like to focus on temperate ecosystems, which cover a major part of the globe, which are well represented in the Fluxnet data base, and about which the proposers have lots of experiences.

Temperate ecosystems deserve special attention because the competition between different land uses of temperate lands (e.g., for food and fibre production, for biodiversity conservation, for renewable energy production) is already now on-going while it is anticipated as or even more strongly for other areas in the future (e.g., tropics). Learning about climate-flux relationships on both annual and intra-annual basis will help to understand adaptation/mitigation options and give further insight into ecosystem functioning. Prelimary data analyses showed a large range of (unexplained) variability (Fig. 1) where a close cooperation of experimentalists and modelers will help to extract common patterns, but also major differences due to biotic and abiotic reasons.

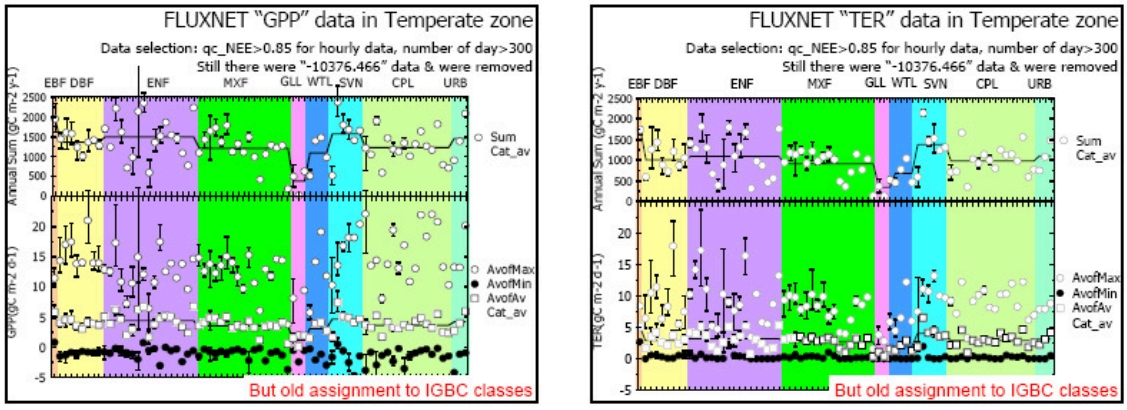

Fig. 1: Prelim analyses of temperate ecosystems for GPP and TER.

We aim to extract general relationships using annual data (Fig. 2), but also study intraannual patterns, thus the effect of phenology. This will also allow us to assess land surface-atmoshhere feedbacks which representation in global coupled models needs to be improved.

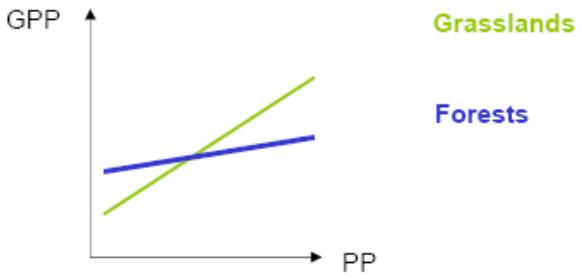

Fig. 2: Differences among land use types within the temperate zone.

We anticipate such detailed analysis also for (in the database) less-represented climate regions and aim to connect to these analyses at a later stage.

Detailed questions:

Part 1: Interannual variations:
- How large is the interannual variability for GPP, TER, NEE of temperate systems globally?
- How do ecosystem types differ in their interannual variability? What explains these differences (species composition, LAI, soils, climate ..)
- Which climatic factors (e.g. PP, T, PAR, ..) dominate these relationships?

Part 2: Intraannual variations:
- How do different temperate ecosystem types differ in their intra-annual variability?
- How do climatic drivers for GPP and TER differ between different parts of the year? (linked to seasonality idea proposed by Bill Munger in La Thuille)
- Can we explain these differences based on biology/management/soils/ …?

Synthesis and outlook:
- How well can models reproduce the flux climate relationships observed from the flux towers?
- Given IPCC scenarios: How will these fluxes develop under future climatic conditions (assuming constant management)?