PROPOSAL FOR FLUXNET SYNTHESIS PUBLICATION

Initial coordinators: Mirco Migliavacca (1), Alessandro Cescatti (1), (2) Miguel D. Mahecha, (2) Markus Reichstein

Collaborators needing access to data: Andrew D. Richardson, Enrico Tomelleri, Nuno Carvalhais, Edoardo Cremonese, Marta Galvagno, Gitta Lasslop

Affiliations: (1) EU Commission – DG Joint Research Centre, (2) MPI Jena

TITLE OF PAPER AND OUTLINE

Influence of the spring phenology on seasonal patterns of ecosystem respiration

Respiration of terrestrial ecosystems (R_{ECO}) is one of the major fluxes in the global carbon cycle and its responses to environmental conditions are important in understanding climate–carbon cycle interactions (e.g. Mahecha et al., 2010). The conceptual processes and complex interactions controlling R_{ECO} are still incompletely understood and the associated uncertainty continues to hamper bottom-up scaling to larger spatial scales (e.g. regional and continental). Linking photosynthesis and respiration is relevant when modeling R_{ECO} across biomes or at the global scale. Empirical evidences for the link between gross primary production (GPP) and R_{ECO} are reported for most, if not all, ecosystems and recently have been observed in synthesis papers based on FLUXNET Lathuille dataset (e.g. Mahecha et al., 2010; Migliavacca et al., 2011).

Beside photosynthetic control on respiration patterns, plant phenology might play an important role mediating the methabolic peak of autotrophic respiration, the supply of photosynthate for respiration of roots, mychorrizae, and heterotrophs utilizing root exudates within the rhizosphere. However, it is complicated to disentangle between phenological and photosynthetic controls on respiration. Curiel-Yuste et al., 2004 showed the control of phenology on soil respiration, while Davidson et al., 2009 reviewed the evidence for this linkage indentifying the research needs for improving the understanding of the physiological and ecological linkages between photosynthesis and respiration in ecosystems. Furthermore, Migliavacca et al., 2011 showed that in deciduous forests, estimates of springtime ecosystem respiration obtained with an empirical model (namely TPGPP - driven by meteorology and gross primary productivity) were biased around the leaf onset. The authors suggested that this bias might be related to a peak in autotrophic respiration due to the intense activity of vegetation during leaf onset, which is not described by the model.

In this study, building on the work presented in Migliavacca et al., 2011, we intend to investigate the role of spring phenology as additional driver of ecosystem respiration in deciduous forests, grasslands and croplands. We will modify the TPGPP model including the explicit dependency between plant

phenology and ecosystem respiration. We will then analyze the ecosystem respiration data from the sites used in Migliavacca et al., 2011 evaluating the potential reduction of biases arising from the use of phenology as additional driver of respiration beside GPP, temperature and precipitation.

PROPOSED SITES TO BE INVOLVED

The sites used in Migliavacca et al., 2011.

PROPOSED RULES FOR CO-AUTHORSHIP

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.

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