PROPOSAL FOR FLUXNET SYNTHESIS PUBLICATION FOR OPENED FLUXNET-LA-THUILE DATA SET

Initial coordinators:: Ryan M. Bright[1,2], Xinhui Lee[4], Edouard Davin[5], Kaiguang Zhao[6] , Thomas L. O'Halloran[3]

Collaborators needing access to data: All coordinators

Affiliations:
[1]The Norwegian Institute for Bioeconomy Research, Ås, Norway

[2]The Norwegian University of Science and Technology, Trondheim, Norway

[3]Forest Resources and Environmental Conservation, Virginia Tech University, Blacksburg, Virginia, USA

[4]Yale School of Forestry, Yale University, New Haven, CT, USA

[5]Department of Atmospheric and Climate Sciences, ETH-Zürich, Zürich, Switzerland

[6]School of Environment and Natural Resources, The Ohio State University, Ohio, USA

TITLE OF PAPER AND OUTLINE

Local climate sensitivity of biogeophysical forcings in terrestrial ecosystems

Radiative forcings (RFs) from albedo changes at the land surface are increasingly including in climate impact assessments of land based projects or systems. The climate response to any RF can vary in space and time and depends on the type of forcing agent and location. The climate response to RFs from CO_2 and other long-lived greenhouse gases (GHGs), for example, is typically expressed in terms of a change in global average surface temperature since they are well-distributed in the atmosphere and hence give rise to RFs that are homogenous in space. This temperature change per unit RF is referred to as the global climate sensitivity. However, the climate response to RFs that are shorter-lived, or which are heterogeneous in space (like those from changes to surface albedo) are more localized (Hansen et al. 1984, Shindell 2014, Shindell et al. 2015). Climate model simulations of albedo changes linked to LULCC have shown that there can be large local- to regional scale variations in the response by temperature, despite being negligible when averaged over the globe, and despite similar RF magnitudes (Davin et al. 2007, Pitman et al. 2009, Brovkin et al. 2013, Jones et al. 2013). This is because, for radiative forcings at the surface, the climate response is complicated by non-radiative internal feedback mechanisms that re-distribute energy and moisture within the lower troposphere (Davin et al. 2007, Lee et al. 2011, Baldocchi and Ma 2013). These mechanisms include changes to canopy conductance and aerodynamic roughness that stem from changes in vegetation physiology and structure. Hence quantifying the local climate sensitivity to LULCC requires quantifying the efficiency by which terrestrial ecosystems re-distribute energy internally following external (albedo change radiative) forcings.

A primary objective of our research will be to utilize in-situ observations of select meteorological and radiation budget terms of Fluxnet and other networks (BSRN) to quantify energy distribution efficiencies for a variety of ecosystems and climate regimes, and to study relationships between it and important environmental (i.e., precipitation, soil moisture) and structural controls (i.e., IGBP land cover type) across space and time. Energy distribution efficiencies will be measured in terms of the energy distribution factor " f " formulated analytically in Lee *et al.* (2011). The identification of strong (statistically significant) patterns of f across the diurnal cycle, across climate zones, and across land cover types will enrich our empirical understanding of the local climate sensitivity to various types of LULCC and, hopefully, facilitate the development of climate metrics that can be applied by the wider land use science community.

PROPOSED SITES TO BE INVOLVED

All sites for which at least one full year (>95%) of half-hour observations of radiation budget variables (SW and LW up & down) are available in addition to Ta and G.

PROPOSED RULES FOR CO-AUTHORSHIP

All members of the FLUXNET community are welcome as coauthors given that they provide academic input for the analysis. Any collaborator not in the FLUXNET community who is willing to provide substantial intellectual input to the analysis is also welcome as a coauthor. If a site PI would rather their data not be used in the synthesis activity, data from their site will not be included in the analysis.