PROPOSAL FOR FLUXNET SYNTHESIS PUBLICATION

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DATASET PROPOSED

LaThuile tower CO2 and H20 flux data

TITLE OF PAPER AND OUTLINE

Global mapping of net ecosystem CO_2 exchange using integrated satellite optical-IR and microwave remote sensing: Algorithm Development for the SMAP Decadal Survey Mission

We have developed a prototype model for satellite remote sensing retrieval of daily net ecosystem CO2 exchange (NEE) using complementary information from optical/IR and microwave brightness temperature observations. MODIS provides GPP/NPP information, whereas soil temperature and moisture are provided by AMSR-E and future SMAP products. **The proposed study will test and apply the modeling approach using MODIS-AMSR-E inputs to estimate NEE globally and will serve as a basis for developing an operational level 4 carbon product under the future Soil Moisture Active Passive (SMAP) Decadal Survey Mission.**

Research Questions:

1) *How do microwave weather and climate parameters (temperature, moisture, freeze/thaw status and growing season length) and optical/IR vegetation (MOD17A2 GPP) observations relate to in situ measurements of NEE, GPP, and R_{eco} across diverse global biomes represented by the global flux tower network?*

2) *How do remotely-sensed climatic variations impact global patterns and temporal dynamics of NEE and the capacity of ecosystems to store carbon?*

3) *How does remotely-sensed disturbance interact with the climatic response of NEE and affect the rate and capacity of ecosystems to store carbon?*

Objectives:

1) *Determine the interactions of temperature, moisture, and vegetation factors on NEE dynamics and soil carbon storage.*

2) *Quantify the remotely sensed impacts of natural climate variability and recent global warming on NEE and associated source/sink strength for atmospheric CO_2.*

3) *Diagnose the interactive role of remotely sensed disturbance in modulating, amplifying, or mitigating the influence of climatic factors on NEE.*

A Bayesian synthesis framework will be employed to calibrate model parameters and uncertainty in relation to land-atmosphere CO_2 flux measurements from the global FLUXNET tower network. Daily land surface temperature and soil moisture information from AMSR-E and GPP information from MODIS will be analyzed at the global scale to explore the primary environmental controls on NEE and component carbon fluces (GPP and R_{eco}). Recent satellite based disturbance products from both MODIS and AMSR-E (fire perimeters, hurricane damage, and flooding) will provide global estimates of disturbance timing and extent, and associated impacts to NEE and carbon storage. The proposed study is expected to provide new understanding of climatic controls on the global balance between photosynthesis, and respiration, associated source-sink activity for atmospheric CO_2, based on remotely sensing information and inform algorithm development for SMAP and other upcoming satellite missions.

This study is distinct from and complementary to current synthesis proposals because of the reliance on global remote sensing data as primary model drivers.

PROPOSED SITES TO BE INVOLVED

All sites containing at least two full years of flux and meteorological data collected after 2002 (the beginning of the EOS Aqua data stream) will be considered.

PROPOSED RULES FOR CO-AUTHORSHIP

Group co-authorship will be included as described in the La Thuile data policy. Co-authorship may also be granted to individual PIs that that contribute directly to the intellectual development of the project. Remote sensing products developed through this study will continue to be openly available to the scientific community.