

PROPOSAL FOR FLUXNET SYNTHESIS PUBLICATION



Initial coordinators:: Matthew Jones, John Kimball, Beverly Law
Collaborators needing access to data: none
Affiliations: Numerical Terradynamic Simulation Group and Flathead Lake Biological Station, University of Montana, Missoula, MT; Forest Ecosystems and Society, Oregon State University, Corvallis, OR

DATASET PROPOSED

LaThuile and Opened Gross Primary Productivity and Ecosystem Respiration Data

TITLE OF PAPER AND OUTLINE

Satellite Microwave Detection of Phenological Start of Season for North America Using AMSR-E Vegetation Optical Depth

We have developed a method for deriving satellite microwave Vegetation Optical Depth (VOD), a measure of the attenuation of microwave radiation propagating through a canopy, which provides phenological time series that are synergistic with satellite optical-IR remote sensing based vegetation indices (e.g. NDVI, LAI) and a bioclimatic growing season index. The VOD database was developed by our group and is freely available (<http://freezethaw.ntsg.umont.edu>); the VOD parameter is a vegetation index that enables temporal and spatial extrapolation of vegetation canopy water content and biomass which, from our initial investigations, has been shown to coincide with seasonal variability in vegetation activity and phenology metrics defined from available tower CO₂ flux measurements. We hope to demonstrate the value of VOD as an available data source for the flux tower community, synergistic with satellite NDVI and LAI subsets, in spatially extrapolating tower fluxes to larger spatial extents. VOD provides a vegetation phenology measure beyond greenness to include changes in canopy water content and biomass which, respectively, may coincide with the onset of ecosystem respiration and gross primary productivity. The satellite microwave VOD parameter is also insensitive to solar illumination and atmospheric contamination (e.g. clouds & smoke) effects, enabling daily observations of vegetation activity with relatively high accuracy.

The proposed study is part of a NASA funded investigation to provide new global phenology products that will be openly available to the flux tower community. The study will compute vegetation start of season (SOS) using TIMESAT for four years (2004-2007) at the ecoregion scale covering the North America continent, and compare these metrics to MODIS-for-NACP phenology products and flux tower gross primary productivity SOS and ecosystem respiration SOS. The study will evaluate pixel scale time series of VOD relative to flux tower GPP and ecosystem respiration. Tower carbon fluxes will provide an integrated indicator of ecosystem phenology that we expect to correspond with VOD seasonality and the accuracy of the phenology product depends on this validation from flux tower data.

Objectives:

- 1.) To provide a new satellite microwave vegetation phenology product that will be made available to the flux tower community.
- 2.) To validate this new product against tower flux measurements of ecosystem respiration and gross primary productivity.
- 3.) To compare this new product to MODIS-for-NACP Greenup Date and attempt to account for bias by incorporating climatic constraints on vegetation net primary productivity.

PROPOSED SITES TO BE INVOLVED

We propose using at least 33 sites with data available between 2003 and 2007. Data availability may limit the number of sites used in the final results as at least three continuous years are needed to properly calculate phenology metrics. Please see table below. Asteriks denote data policy availability according to SynthDataSummary.xls from fluxdata.org.

*LaThuile, **Open, ***Fair Use

SiteID	Name
US-ARM**	OK - ARM Southern Great Plains site- Lamont
US-Atq*	AK - Atqasuk
US-Aud*	AZ - Audubon Research Ranch
US-Bkg*	SD - Brookings
US-Blo*	CA - Blodgett Forest
US-Bo1*	IL - Bondville
US-Bo2*	IL - Bondville (companion site)
US-Fpe*	MT - Fort Peck
US-FR2**	TX - Freeman Ranch- Mesquite Juniper
US-Goo*	MS - Goodwin Creek
US-Ha1***	MA - Harvard Forest EMS Tower (HFR1)
US-IB1*	IL - Fermi National Accelerator Laboratory- Batavia (Agricultural site)
US-IB2*	IL - Fermi National Accelerator Laboratory- Batavia (Prairie site)
US-Ivo*	AK - Ivotuk
US-KS2*	FL - Kennedy Space Center (scrub oak)
US-Moz*	MO - Missouri Ozark Site
US-SO2*	CA - Sky Oaks- Old Stand
US-SO3*	CA - Sky Oaks- Young Stand
US-SO4*	CA - Sky Oaks- New Stand
US-SRM**	AZ - Santa Rita Mesquite
US-Syv***	MI - Sylvania Wilderness Area
US-Ton***	CA - Tonzi Ranch
US-Var***	CA - Vaira Ranch- lone
US-WCr***	WI - Willow Creek
US-Wkg**	AZ - Walnut Gulch Kendall Grasslands
US-Wrc*	WA - Wind River Crane Site
CA-Ca1*	British Columbia- Campbell River - Mature Forest Site
CA-Oas*	Sask.- SSA Old Aspen

CA-Let*	Lethbridge
CA-Mer***	Eastern Peatland- Mer Bleue
CA-Obs*	Sask.- SSA Old Black Spruce
CA-Qfo**	Quebec Mature Boreal Forest Site
CA-WP1*	Western Peatland- LaBiche-Black Spruce/Larch Fen

PROPOSED RULES FOR CO-AUTHORSHIP

We will follow guidelines of the La Thuile data policy and we will be responsive to the needs of the Tower Principal Investigators regarding intellectual property rights of their data. Co-authorship may also be granted to individual PIs who contribute to the intellectual development of the project. Remote sensing products developed through this study will continue to be openly available to the scientific community.

CVs of Proposers included as attachment with email submission.