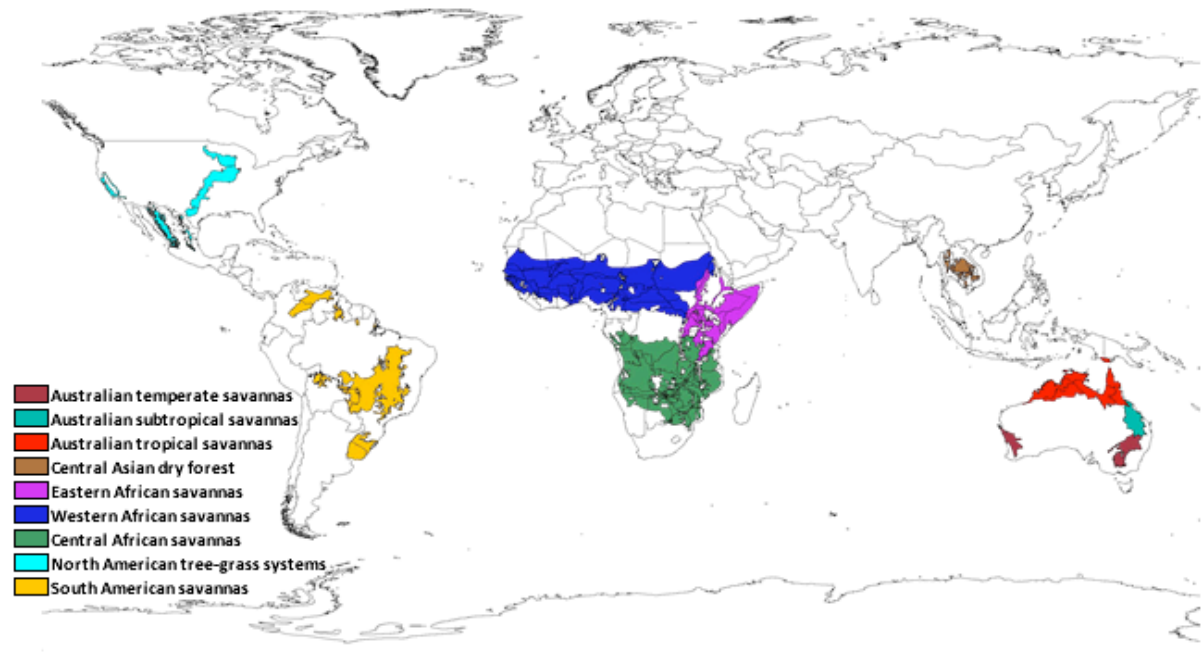


**Land Breakout
CMMAP Team Meeting
January 11, 2011
Berkeley CA**

Savanna

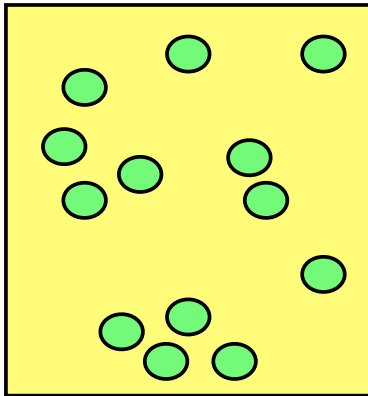
- Essentially unexplored biome, numerically
- Per-area carbon flux low
- large global domain
- important for human activity
- Heterogeneous



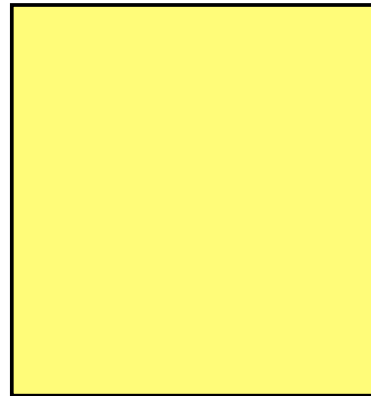
Savanna: Numerical Representation



Reality

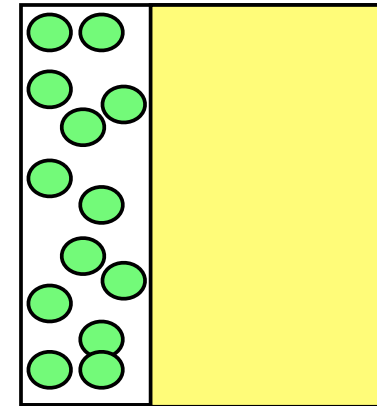


Dominant
Vegetation
Class



(SiB)

Plant
Functional
Type



(CLM)

Community Land Model (CLM)

BONAN ET AL.: PLANT FUNCTIONAL TYPES AND CLIMATE MODELS

5 - 3

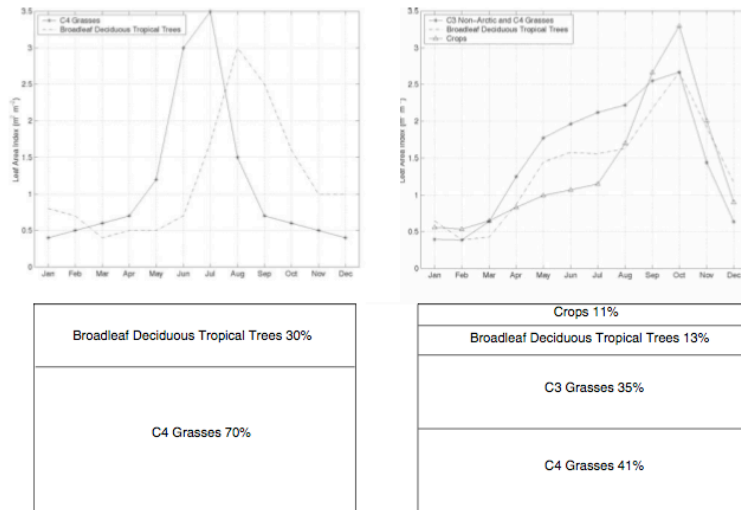
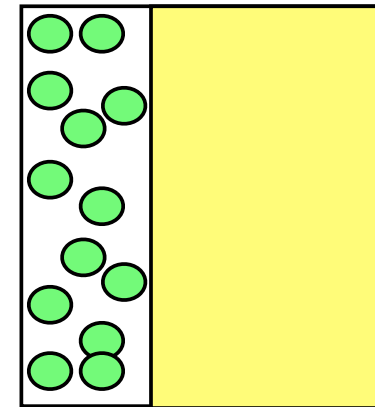


Figure 1. Composition and structure of vegetated patches in a grid cell. The figure shows, for a single grid cell centered on latitude 7.5°N and longitude 4.5°W, (top) the monthly leaf area index for each PFT patch and (bottom) the relative abundance of each PFT. The left panels show the fixed PFT LAI and PFT composition used in the biome data set of the standard model. The right panels show the new satellite-derived LAI and PFT composition for the same grid cell.



Bonan et al, 2002

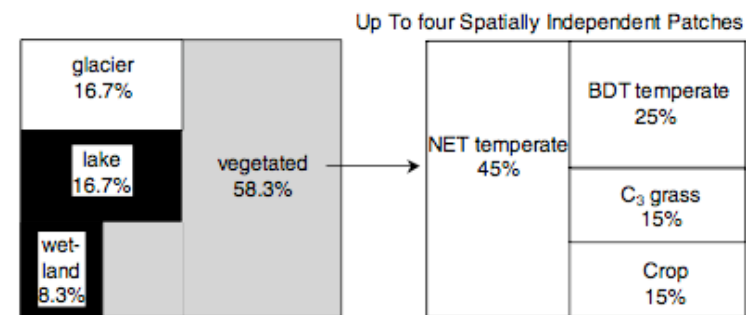


Figure 2. Subgrid patches of glacier, lake, wetland, and vegetation in the new version of the NCAR LSM. The vegetated portion of the grid cell is divided into up to four PFTs with unique composition and leaf area.

New Modeling Strategy

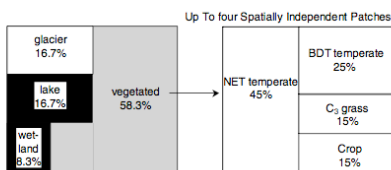
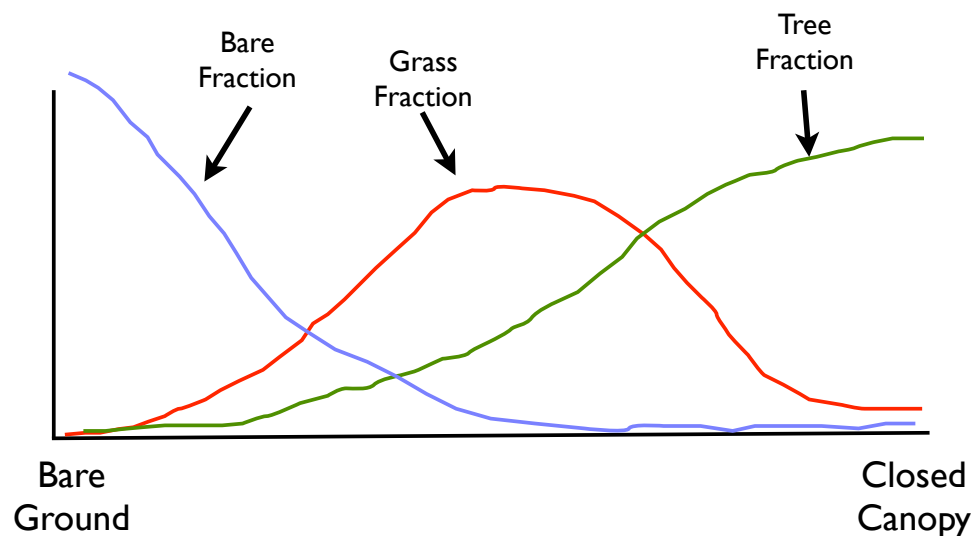
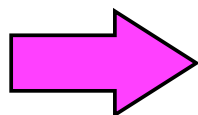
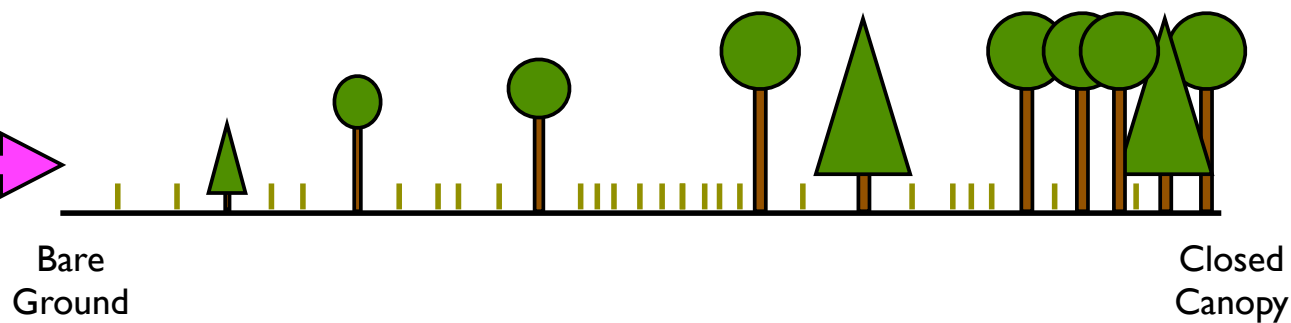
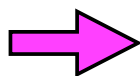


Figure 2. Subgrid patches of glacier, lake, wetland, and vegetation in the new version of the NCAR LSM. The vegetated portion of the grid cell is divided into up to four PFTs with unique composition and leaf area.

Ice	Hetero. Vegetation
Water	
Urban	
Crop	



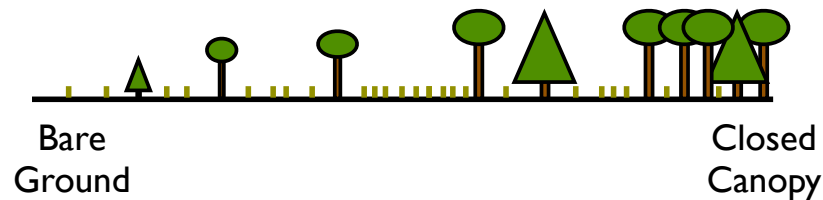
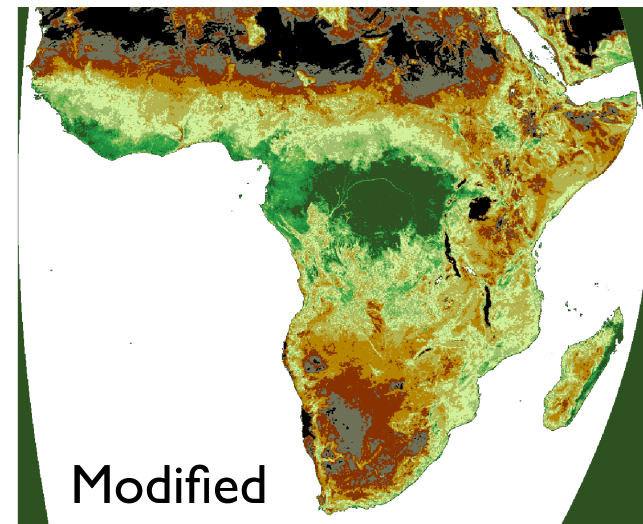
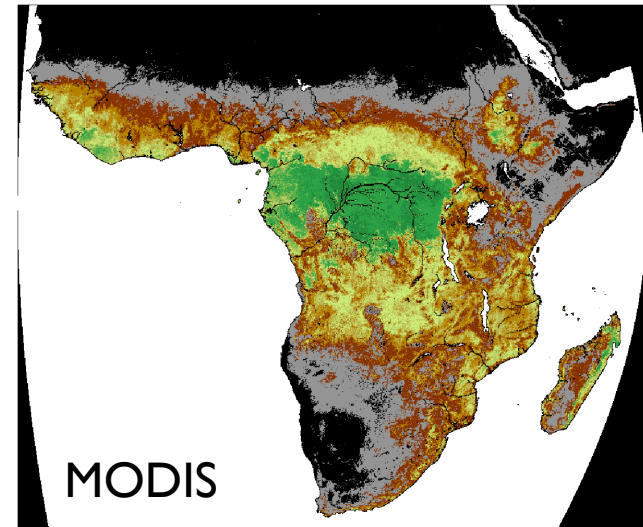
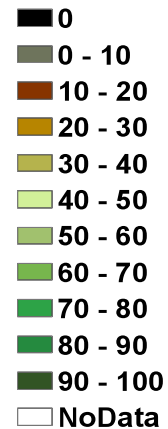
Multiple Physiology!
(Hanan et al 2005)



What Vegetation Information is Available?

- MODIS Vegetation Cover Fraction (VCF) Maps
- Vegetation Type Maps (Hansen, DeFries, collaborators)

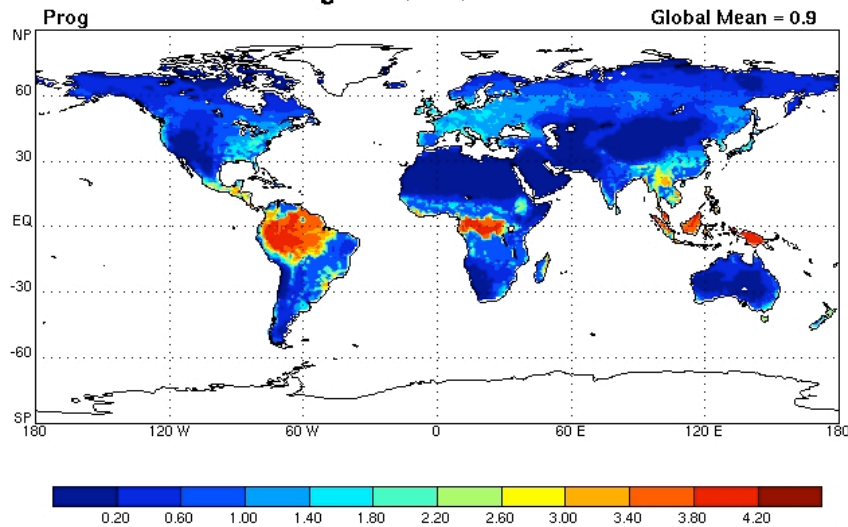
woody cover %



From Bucini et al, FRSES 2010

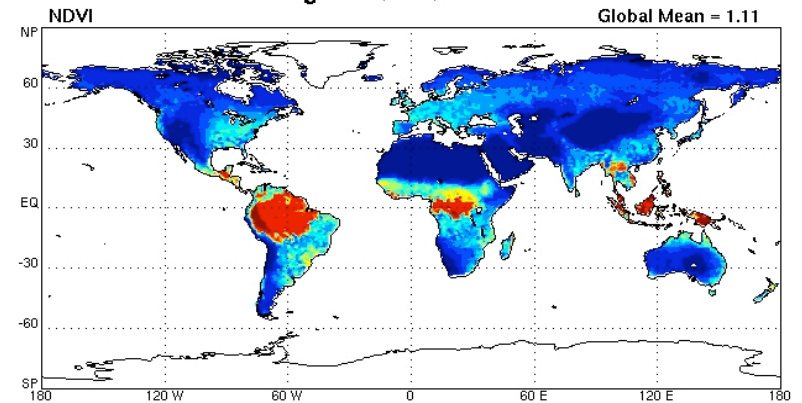
Prognostic Phenology

Mean GPP 2000-2006
kg CO₂ / m² / month

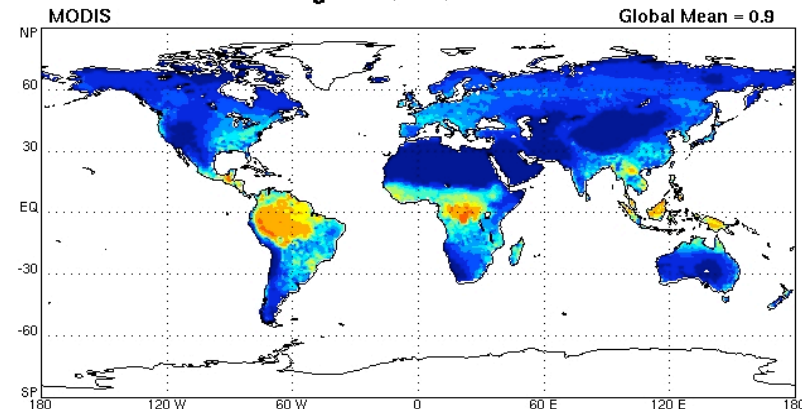


Oct26, 2010

Mean GPP 2000-2006
kg CO₂ / m² / month



Mean GPP 2000-2006
kg CO₂ / m² / month

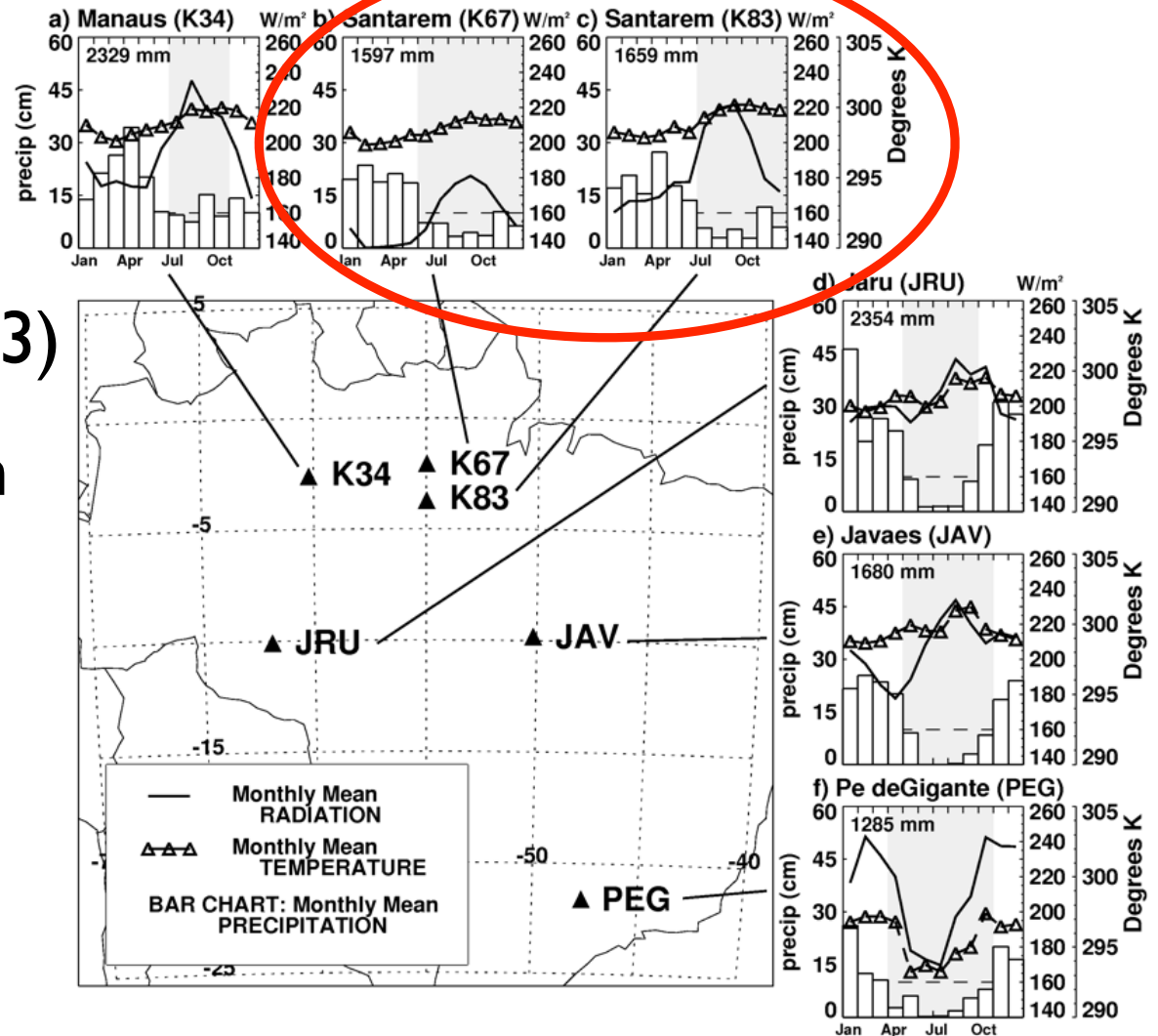


Oct26, 2010

- Prognostic Phenology still has trouble in savanna
- otherwise, a reasonable result

Sunlit Shaded Testbed?

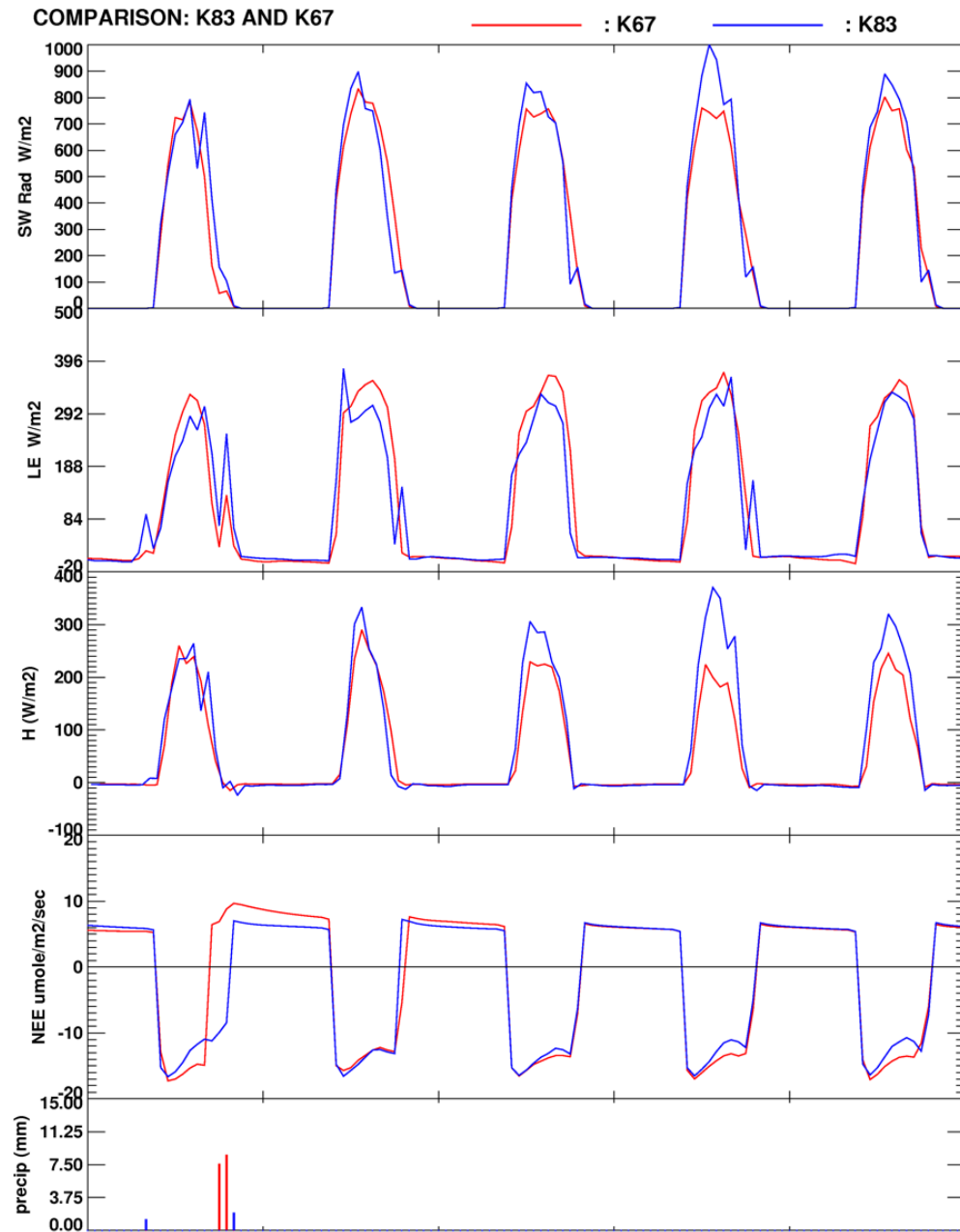
- Tapajos River National Forest, Brazil (KM67/KM83)
- Sites are near each other
- Virtually identical- but look at radiation!



Sunlit/ Shaded: Tapajos K67/K83

- Is it instrument bias?

No.



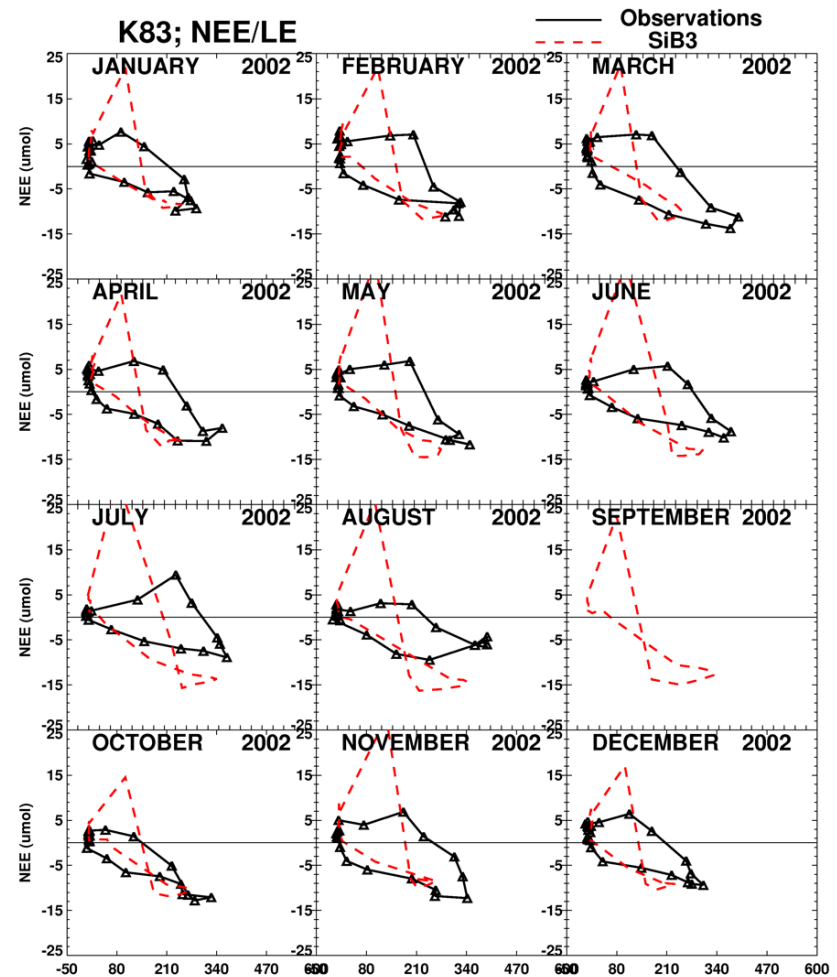
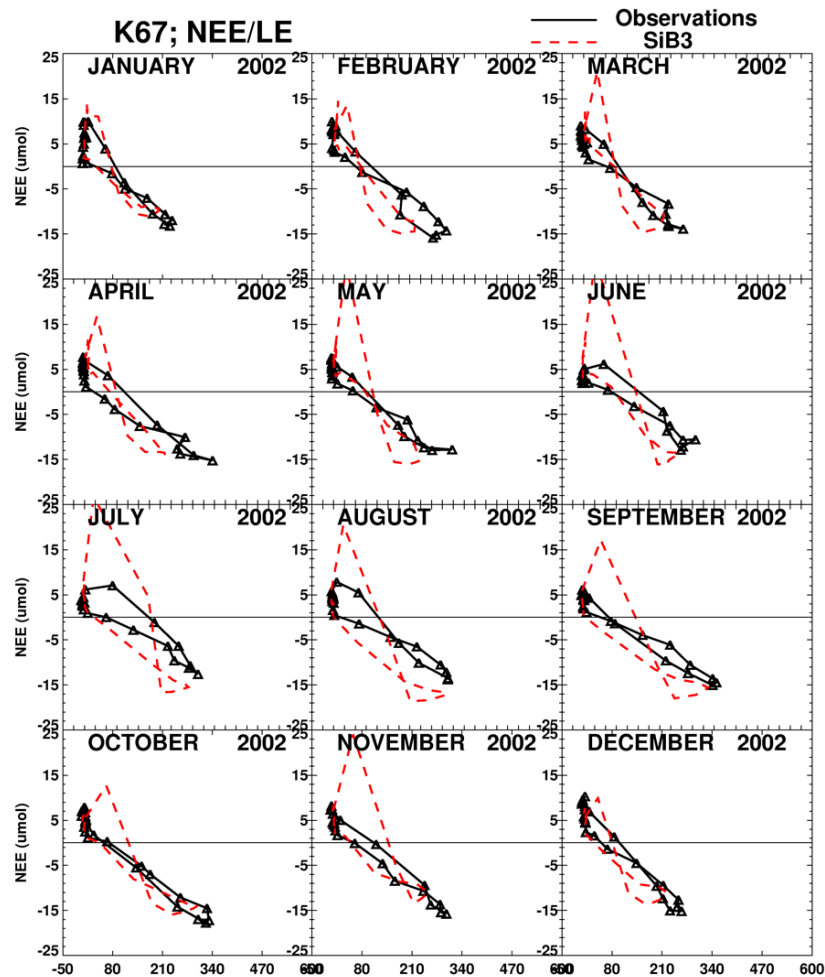
So What's going on?

- River Breeze (Silva Dias et al. 2004)
- Convergence line (Lu et al. 2005)



Figure 9. Satellite image obtained from LandSat 7 ETM+ scene for path 227 and row 62, on 31 July 2001. It shows that during a clear day, the low-level cumulus clouds favor the east bank of Tapajós River. The image is located at the Web site of Tropical Rain Forest Information Center (TRFIC), which is jointly hosted by LBA-ECO and Michigan State University.

What do the Obs Show?



Differential Response: K67 is more 'linear'

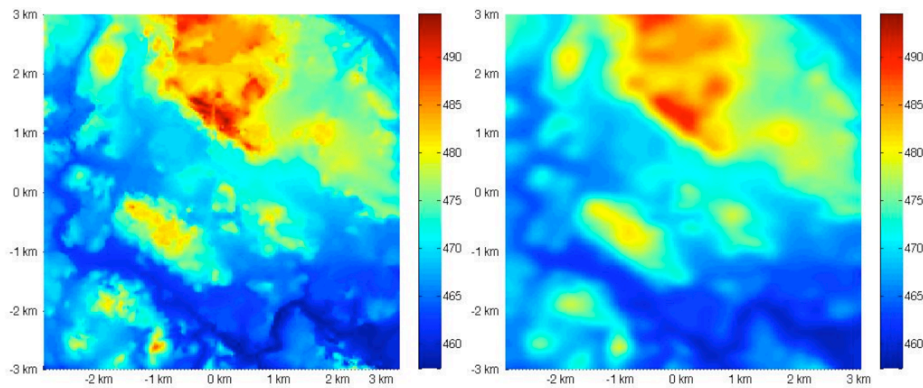
Wetland Methanogenesis and Heat Flux

Estimation of methane respiration and oxidation, as well as latent and sensible heat with a saturated area derived from the topographic index.

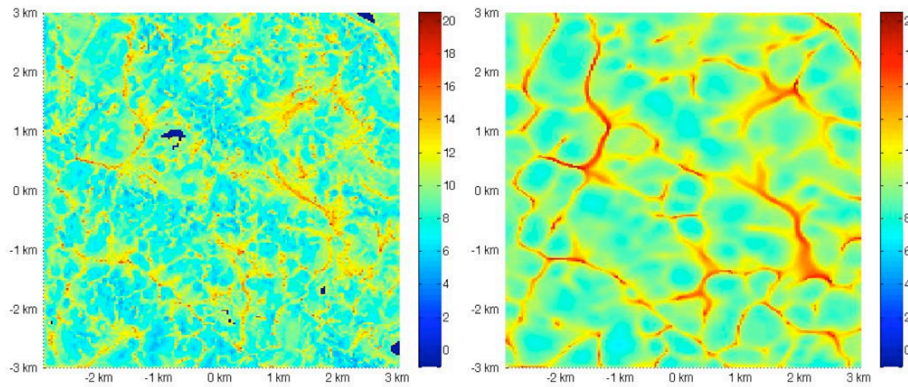
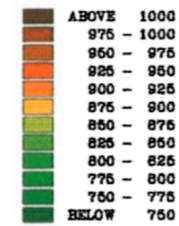
Parker Kraus



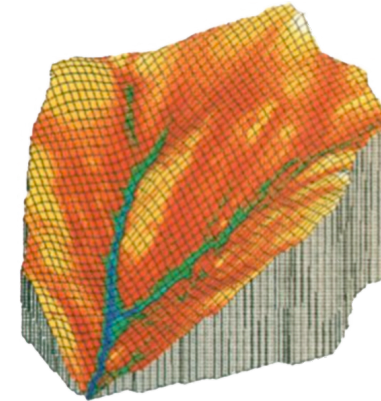
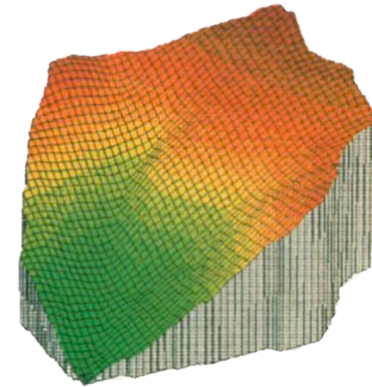
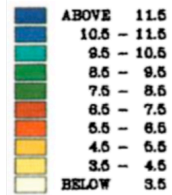
The Topographic Index of TOPMODEL



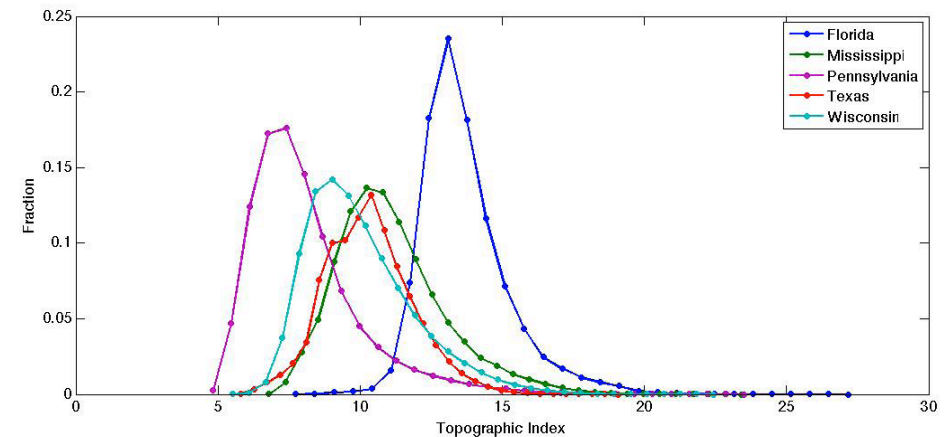
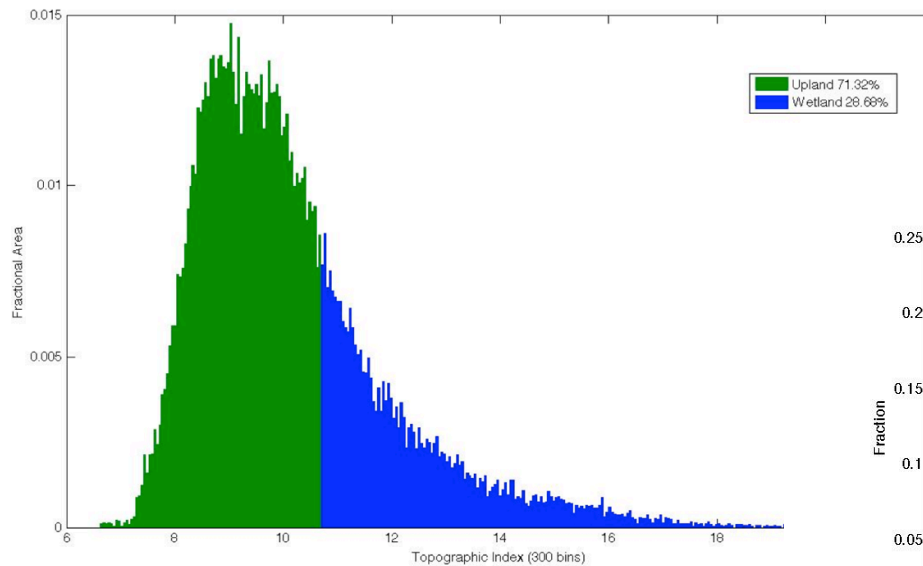
Elevation (m)



$\ln(a/\tan\beta)$



Wetland Fraction & BGC



Methanogenesis

$$F_{CH_4} = -k_{CH_4ox} \cdot Q_{10ox}^{\left(\frac{T(t)-T_0}{10}\right)} + k_{CH_4resp} \cdot SatArea(hist(\Gamma), vol_{H_2O}) \cdot Q_{10resp}^{\left(\frac{T(t)-T_0}{10}\right)}$$

- Flux equals the sum of two Arrhenius-type equations representing methane respiration and oxidation.

Methane Emissions

