

The carbon and water functionality of
the Atlantic forest,
and comparisons to Amazonian and
Cerrado's ecosystems

Humberto Rocha

Those without whom it wouldn't be possible this way



Large Scale Biosphere-
Atmosphere Experiment
in Amazonia



Programa FAPESP de
Pesquisa sobre
Mudanças Climáticas
Globais (PPMCG)

Students and technicians of Universidade de São Paulo Helber Freitas, Eduardo Gomes, Emilia Brasilio, Nilson Neres, Jonatan Tatsch + muitos outros

Embrapa Meio Ambiente Osvaldo Cabral

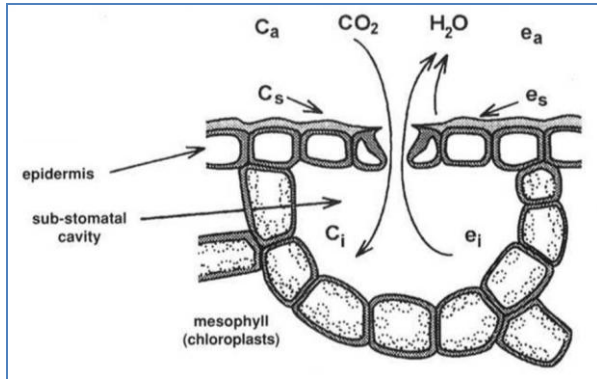
Unicamp and Cena/Usp Carlos Joly, Luiz Martinelli

IBt Marcos Aidar + estudantes

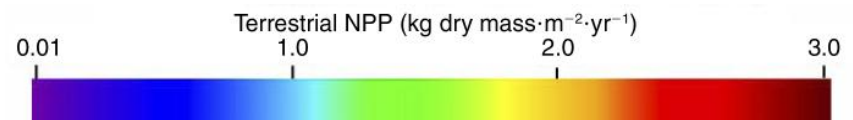
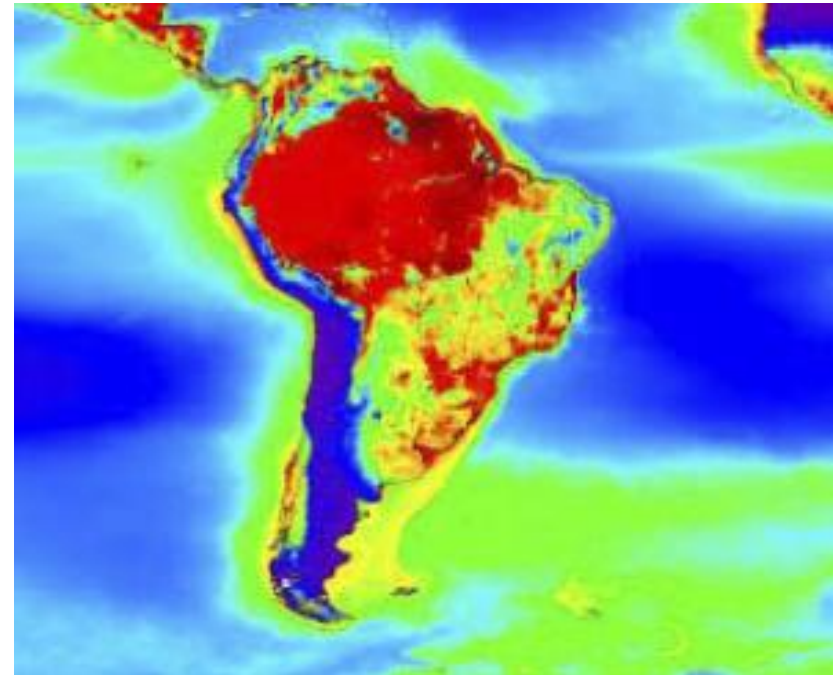
INPE Carlos Nobre, Rogerio Carneiro

Foreign universities (in USA: UCI, UoA, SUNY, Harvard , in Europe: UoE, ULeeds, Alterra)

Ecosystem functionality for CO₂ and water



Productivity

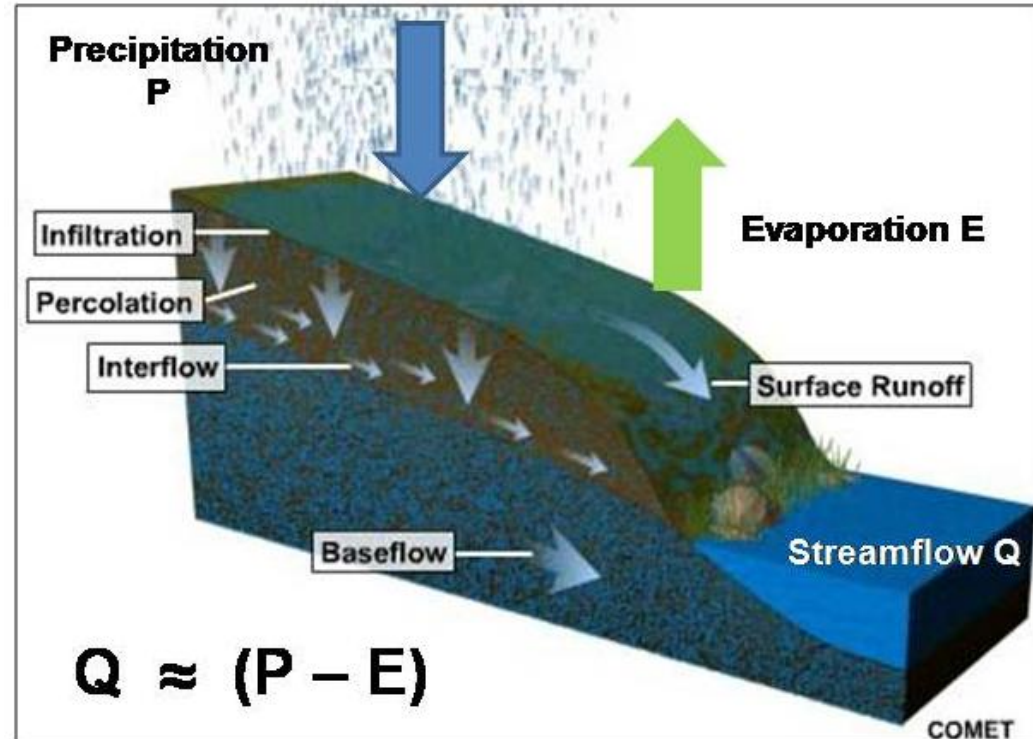
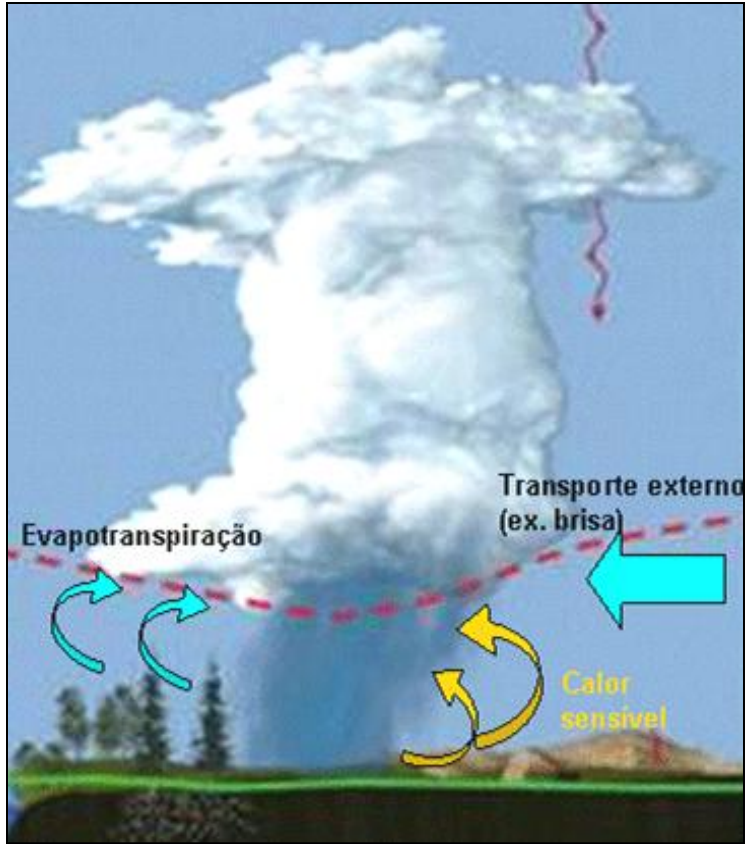


Net primary productivity (NPP)

CASA model (Imhoff 2004) & SeaWiifs, apud Huston & Wolverton (2009)



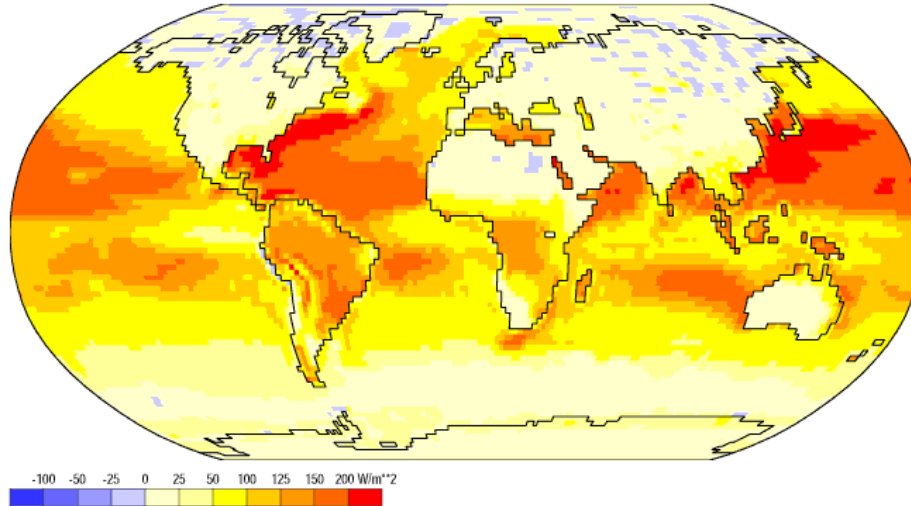
Evapotranspiration



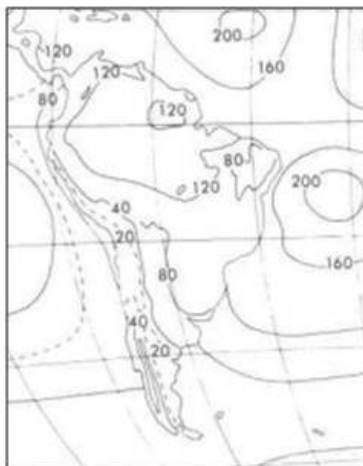
Evapotranspiration

Latent Heat Flux

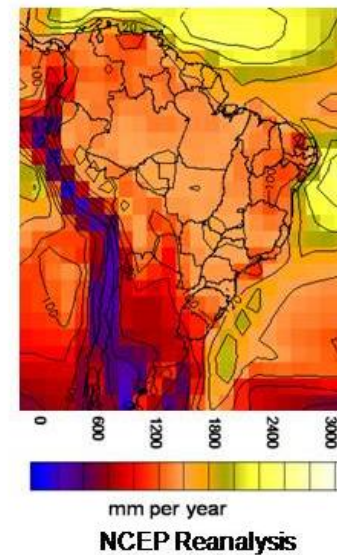
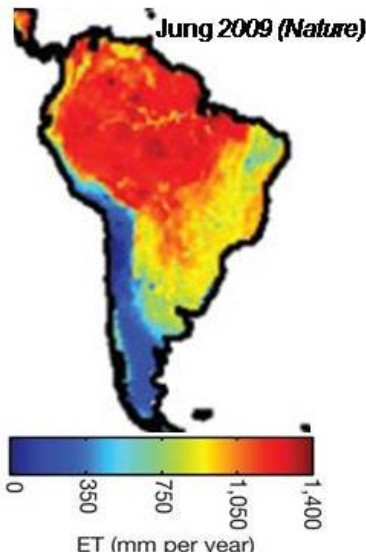
Dec



Data: NCEP/NCAR Reanalysis Project, 1959-1997 Climatologies
Animation: Department of Geography, University of Oregon, March 2000



Evapotranspiration (cm per year)
Baumgartner & Reichel (1975)



Which are the big questions here ?

Can we see distinguishable patterns of productivity and water use for the different brazilian ecosystems?

(this talk)

Does it help us to use models and predict the ecosystems' functionality ?

(... Later)

Field sites



- 1. ATLANTIC MOIST MOUNTAIN FOREST**
(Nucleo St Virginia, Parque Estadual da Serra do Mar)
- 2. CERRADO RESTRITO**
(Gleba Pé de Gigante)
- 3. FLOODPLAIN**
(in FOREST-SAVANNA transition areas – Bananal Island)
- 4. TROPICAL AMAZONIAN terra firme FOREST** – Santarem K83 Flona Tapajos

Measurements in the flux tower sites



top

Irradiância solar e RFA (incidente, refletida)

(Rn) Saldo de radiação =
+ H (fluxo calor sensível)
+ LE (evapotranspiração)
+ Fluxo CO₂

Radiômetros

Anemômetro sônico

Analisador CO₂ & H₂O



Data control

ground



Soil moisture



Streamflow

Discussion

Field and satellite spectral indices

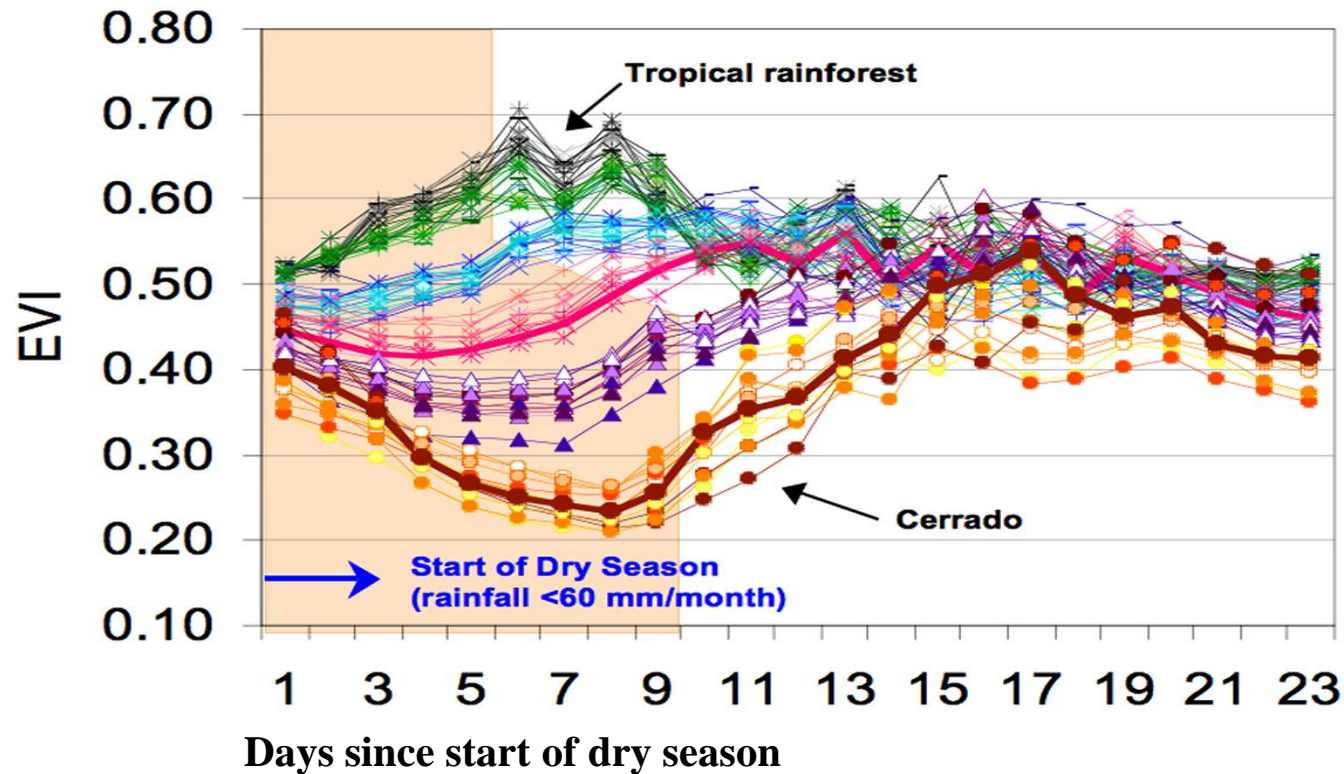
Evapotranspiration and incoming energy

Ecosystem respiration and NPP

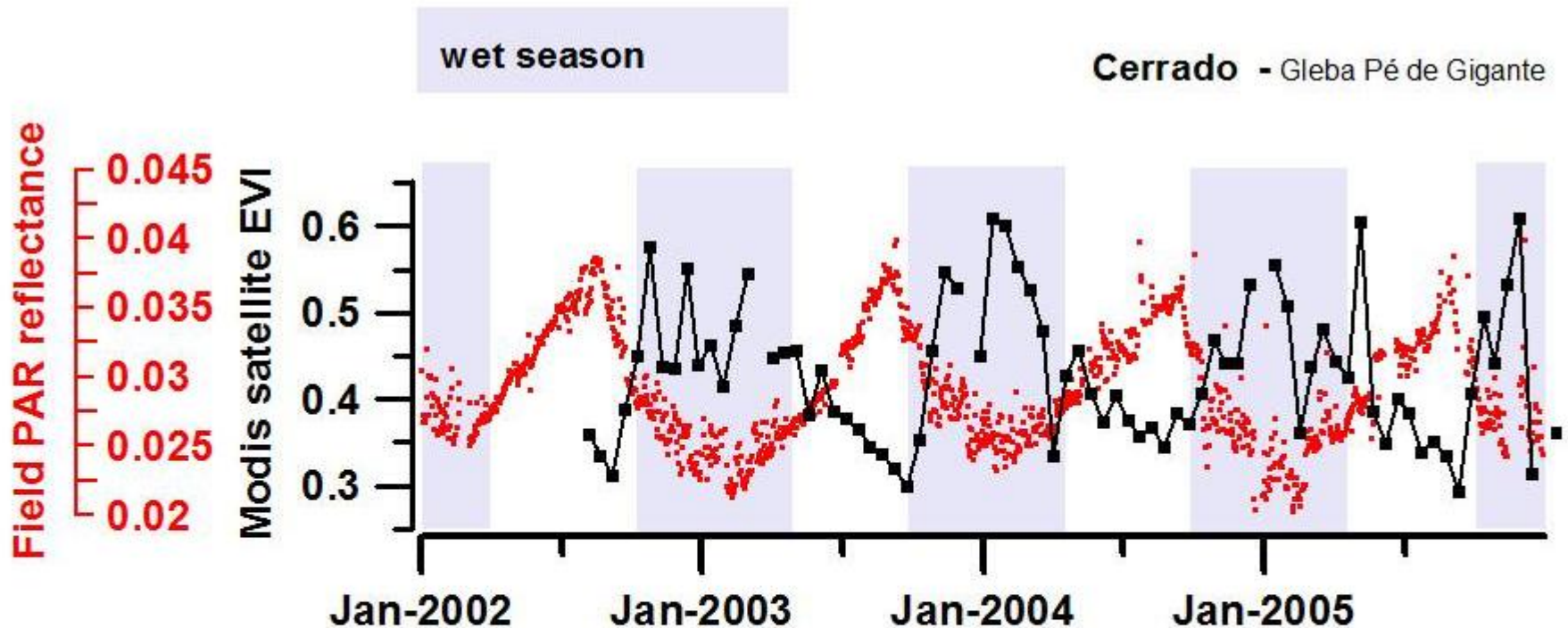
Canopy response to drought

Patterns in Amazonia and surrounding Cerrado

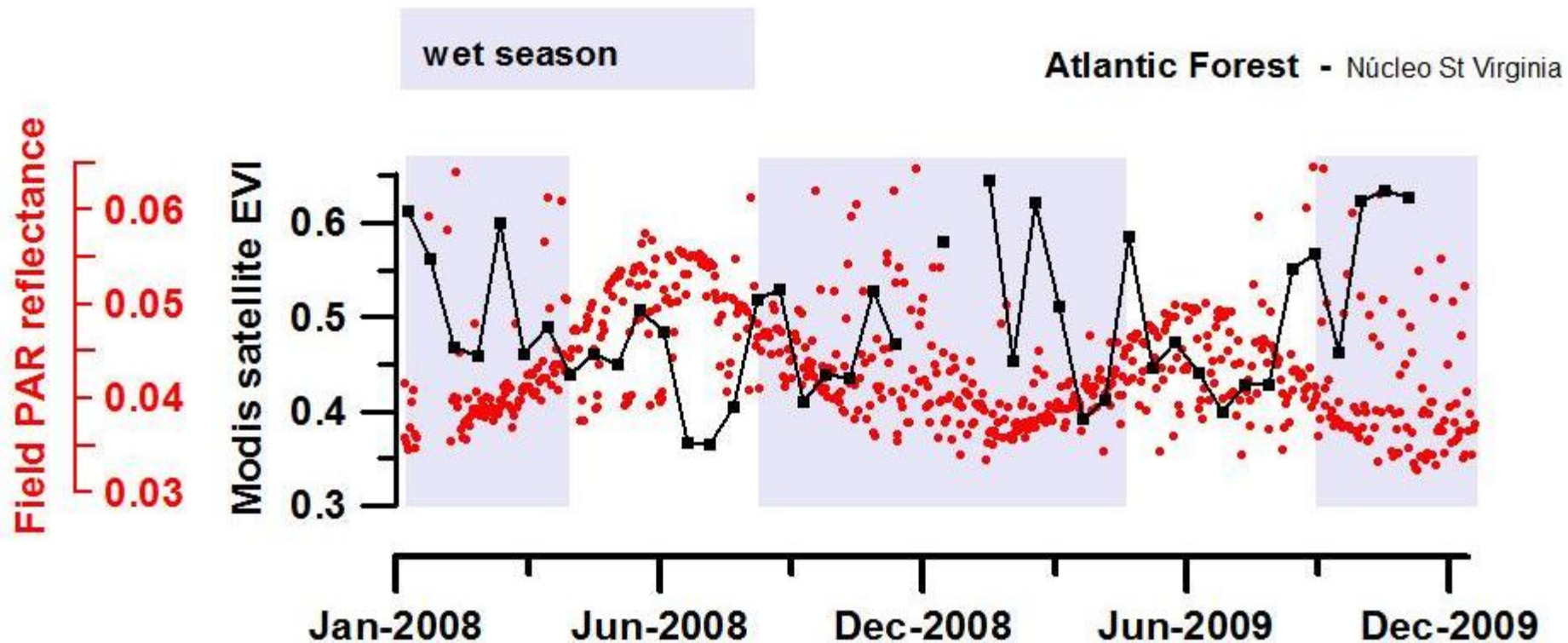
Tapajos - Cuiaba Transect



PAR reflectance (albedo) and satellite EVI - Cerrado

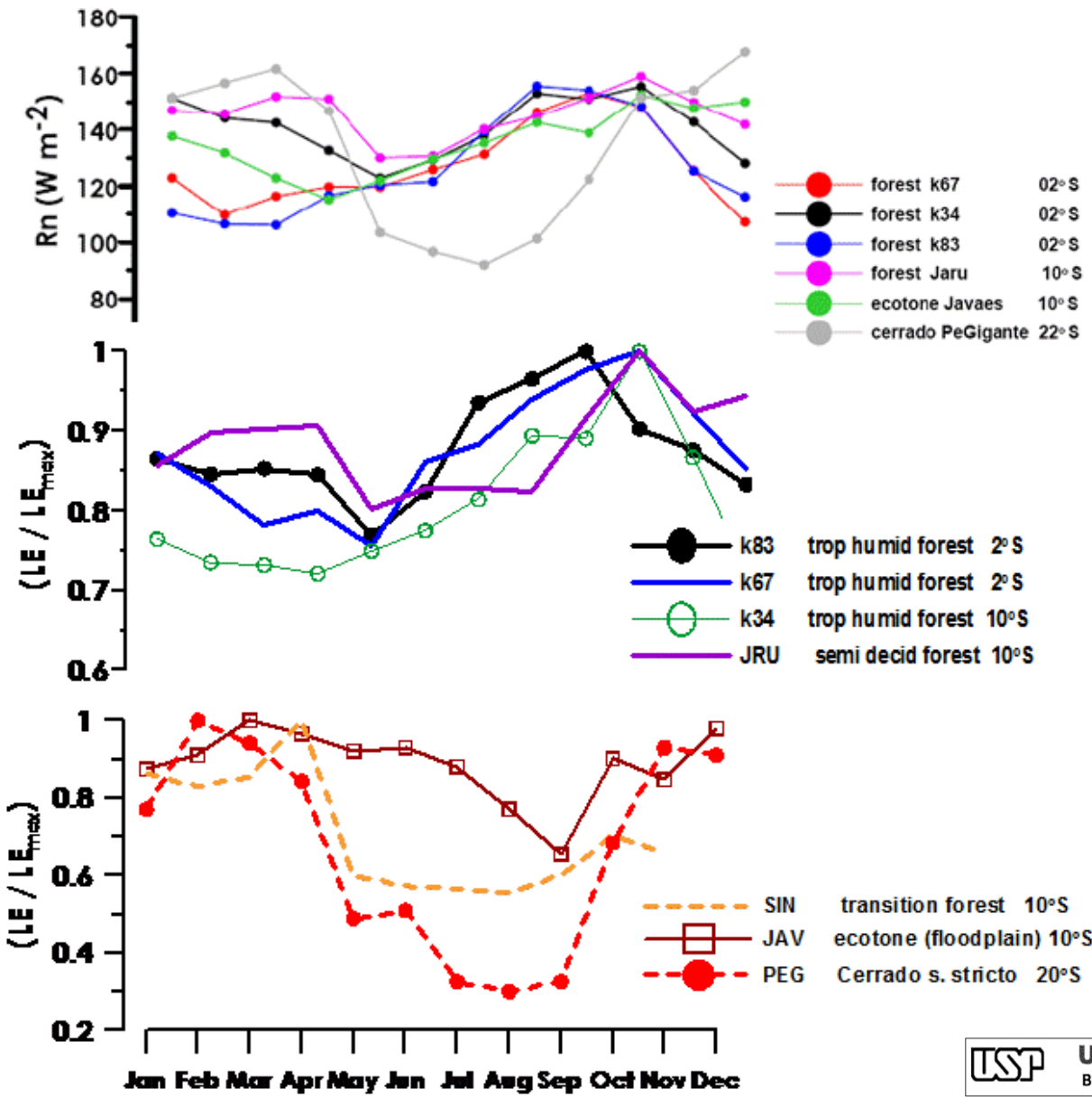


PAR albedo and satellite EVI – Atlantic Forest



Seasonality of evapotranspiration across forest-cerrado biomes

(Rocha et al 2009) JGR



Available energy

LE / LEmax

Evergreen and semideciduous tropical forests

Cerrados, floodplain and transitional forest

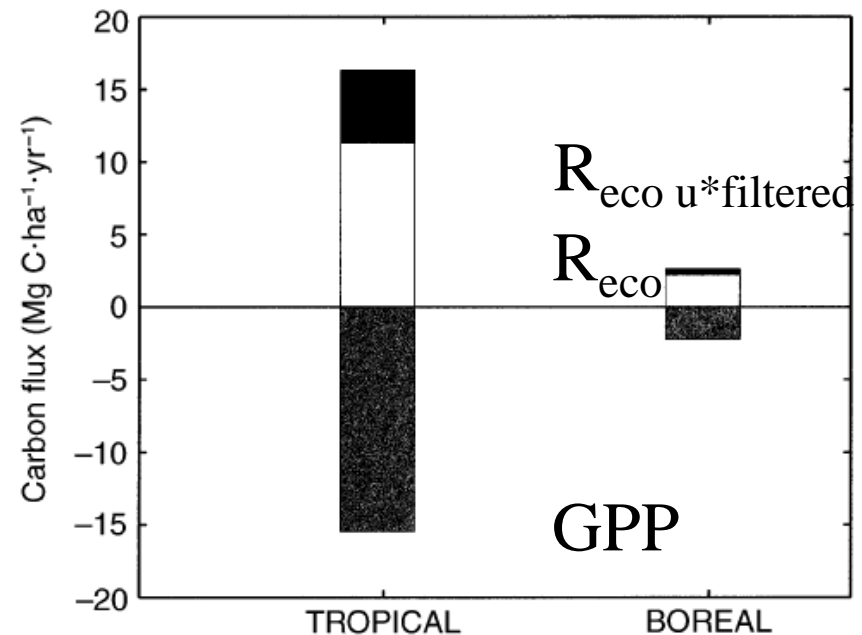
Estimate of NPP and Reco

R_{eco} = nighttime flux u^*
filtered

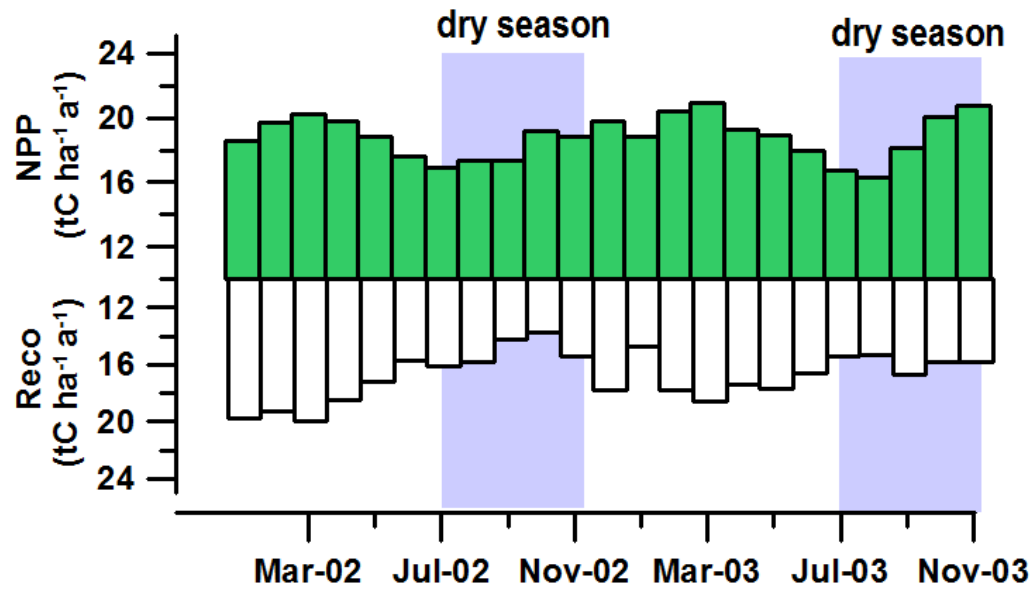
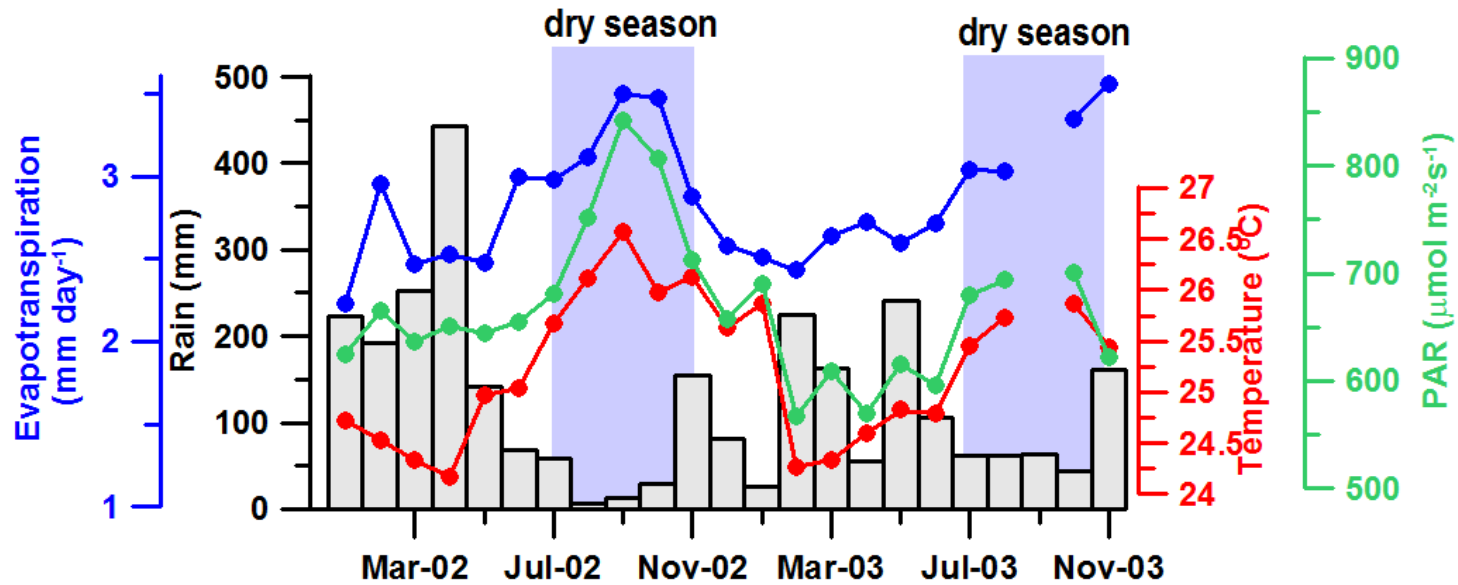
GPP = daytime flux - R_{eco}

CUE = R_a / GPP

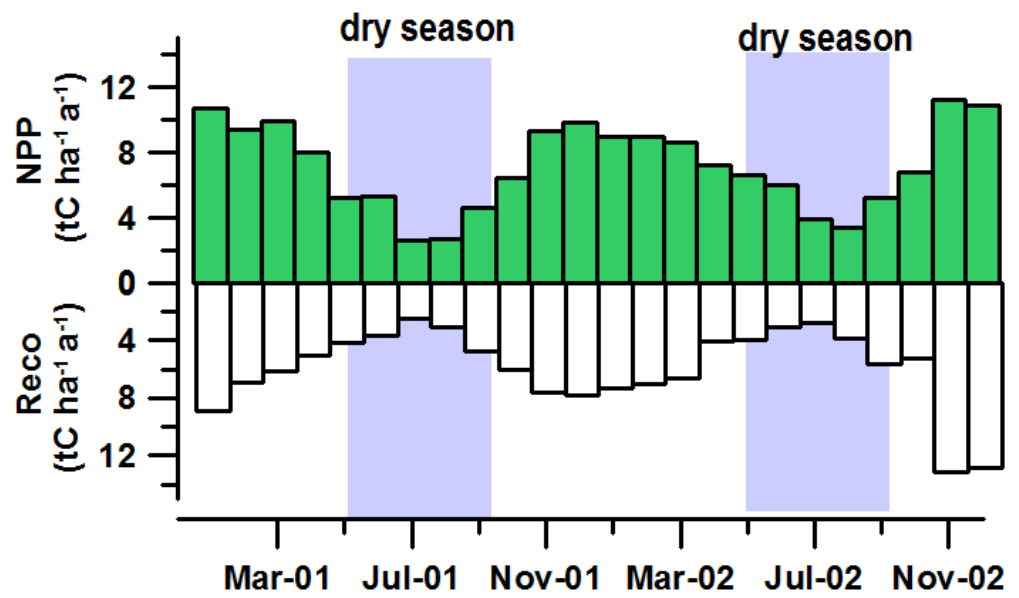
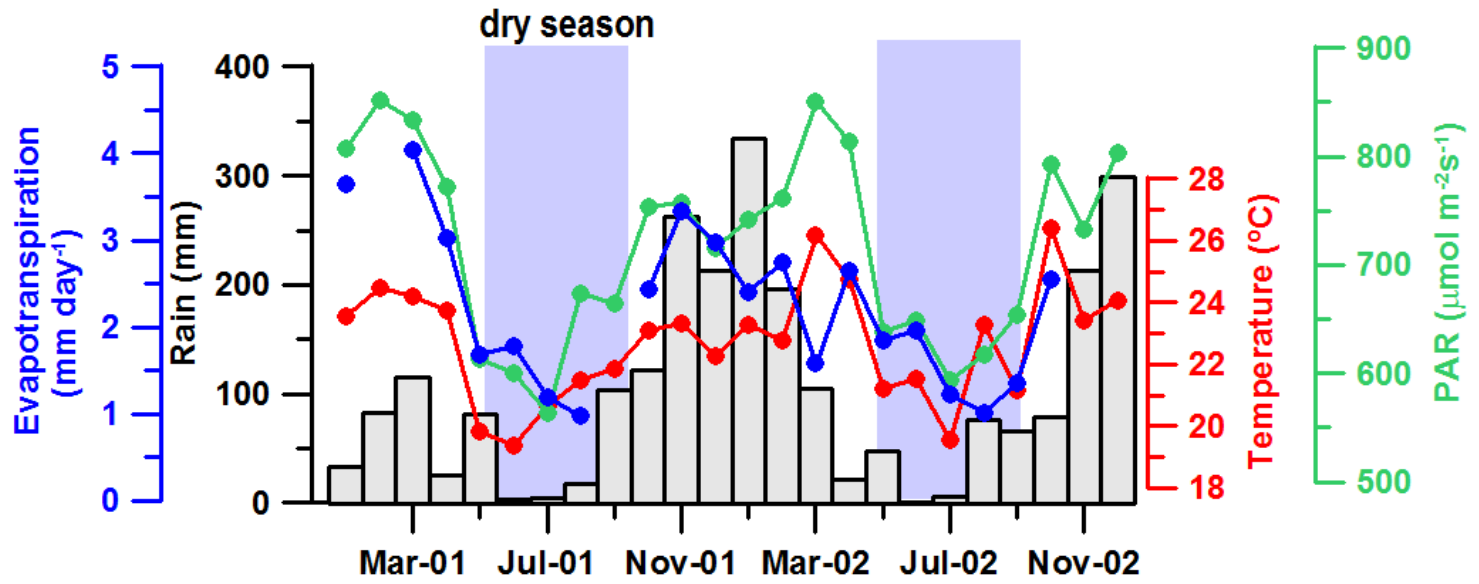
NPP = $GPP \cdot (1 - CUE)$



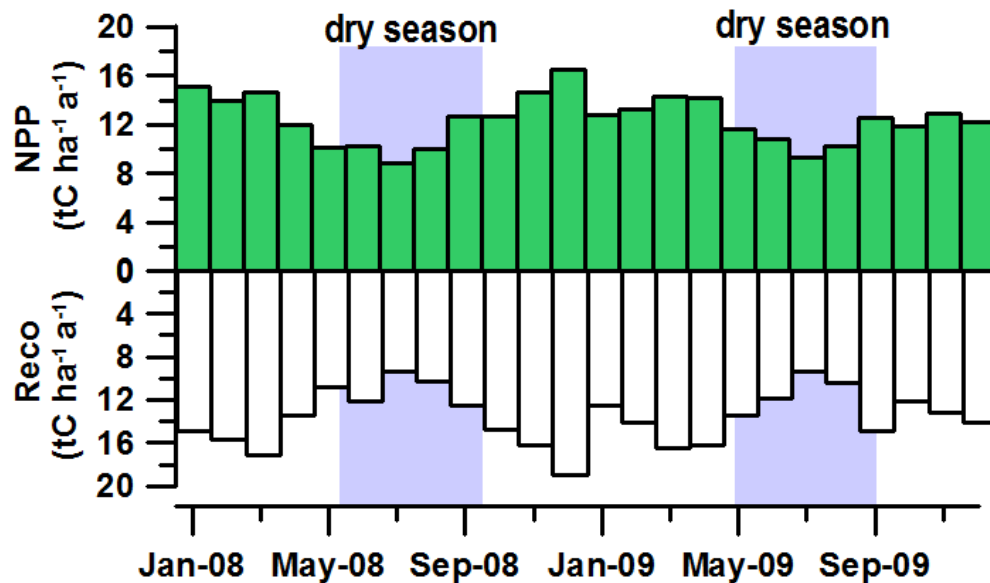
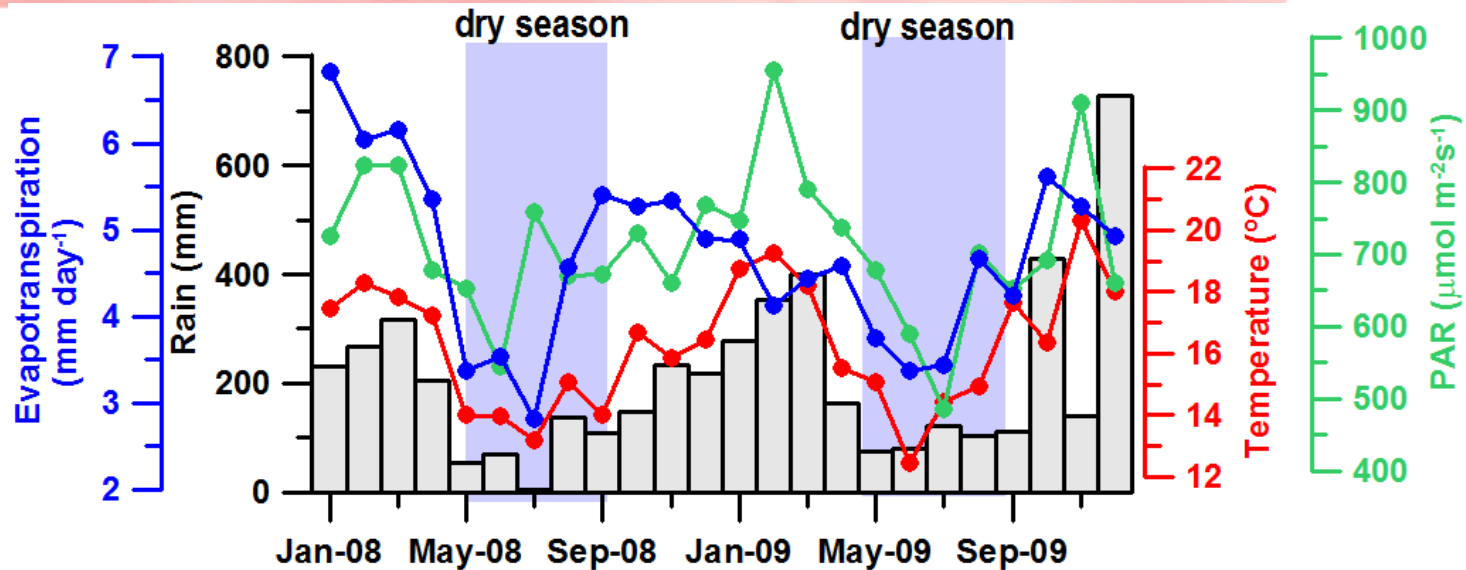
Amazonian tropical Forest – k67 Flona Tapajos



Cerrado restrito - Gleba Pé de Gigante, SP



Atlantic high mountain Forest – St Virginia



NPP dependence on temperature and rain

- Amazon forest k67 Flona Tapajós
- Atlantic mountain forest St Virginia
- Cerrado restrito Péde Gigante

