Reunião Programa Fapesp Mudanças Climáticas Globais

11 May 2011

Project Carbon tracker and water availability: controls of land use and climate changes

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FAPESP

FAPESP Research Program on Global Climate Change Workshop

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USP Universidade de São Paulo BRASIL

Laboratório de Clima e Biosfera – IAG / USP

Team

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UK	E. Gloor (Univ Leeds), O. Phillips, Y. Malhi (Univ Oxford), S. Waldron (Univ Glasgow), J. Grace (Univ Edinburgh)
USA	J. Miller/NOAA

Large Scale Biosphere-Atmosphere Experiment in Amazonia

Programa FAPESP de Pesquisa sobre Mudanças Climáticas Globais (PFPMCG)

Main questions

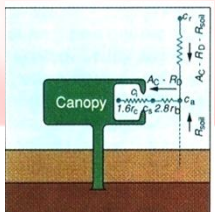
1. Which is the Carbon balance of the Amazon basin ?

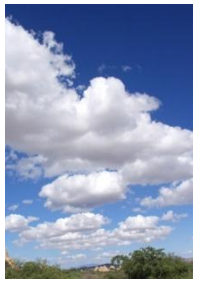
(a) How do natural vegetation, rivers and other processes contribute to local and regional C balance ?

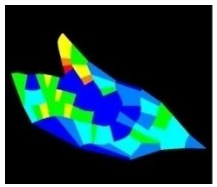
2. How can land use change alter the hydrological cycle and river discharge ?

(a) Do reforestation helps to control floods and minimum river flows?

(b) Do crops, reforestation and pastureland help to change regional evapotranspiration ?







Watershed modelling and flux tower studies

Ecophysiology (SiB2)

Atmosphere (BRAMS)

Hydrology (SWAT model, DBHM model)

Four selected watersheds:
Tocantins-Araguaia

Mogi-Guaçu river

Piracicaba river (PCJ basin)

Paraibuna-Paraitinga

Field sites

1. TROPICAL AMAZONIAN terra firme FOREST – Santarem K67 Flona Tapajos

2. FLOODPLAIN (in FOREST-SAVANNA transition areas – Bananal Island)

3. CERRADO RESTRITO (Gleba Pé de Gigante)
+ Sugar Cane (Usina Sta Rita)
+ Eucaliptus (Faz Cara Preta)

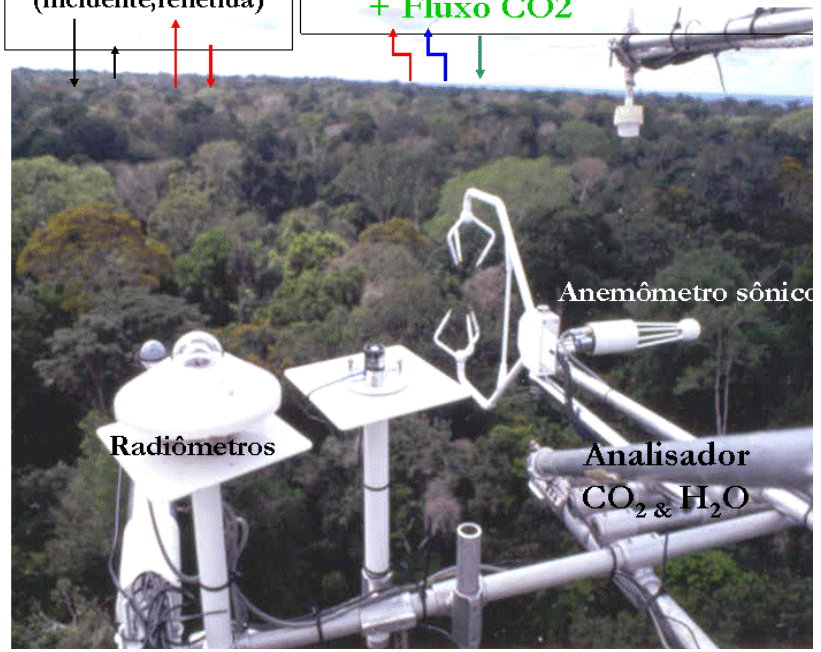
4. ATLANTIC MOIST MONTANE FOREST (Nucleo St Virginia Parque Estadual erra do Mar)

Measurements in the flux tower sites

top

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

Irradiância solar e RFA (incidente,refletida)

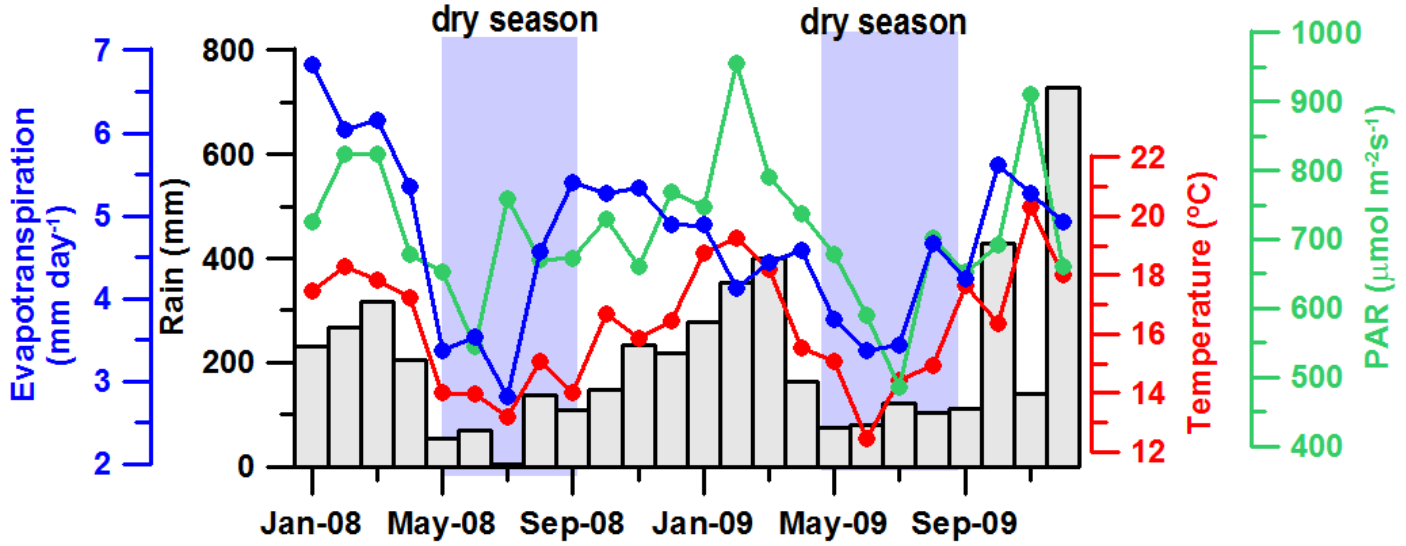


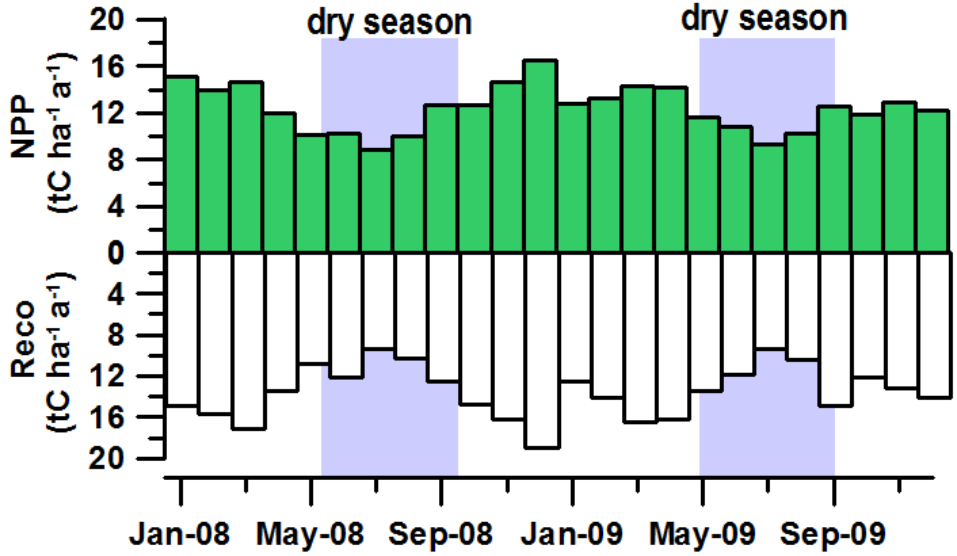
Data control

ground

Water and CO2 fluxes - Atlantic montane Forest (Serra do Mar)

H. Freitas, E. Brasilio, H.Rocha, R. Carneiro





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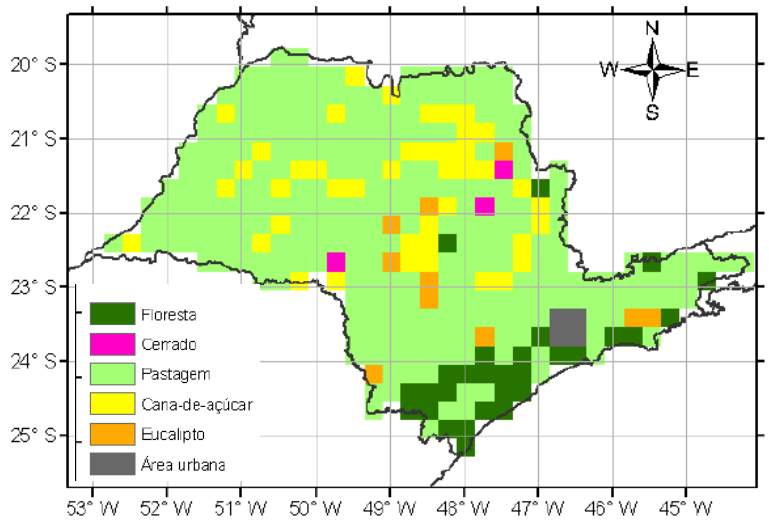
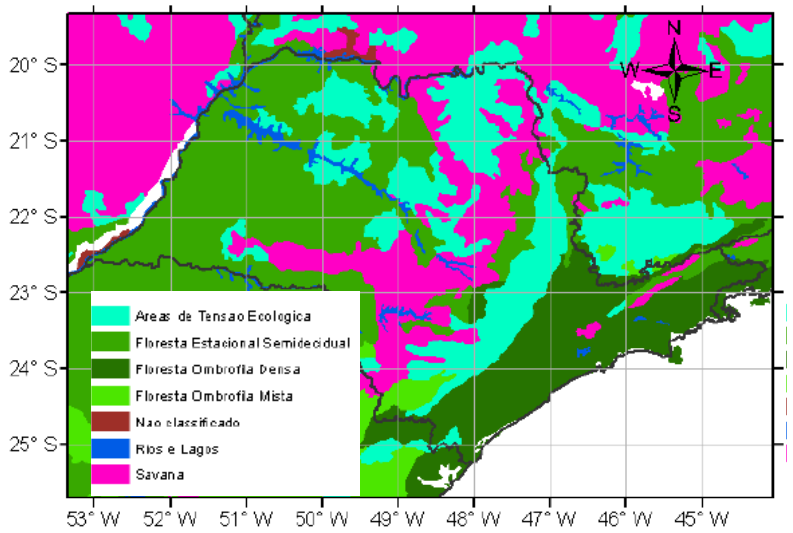
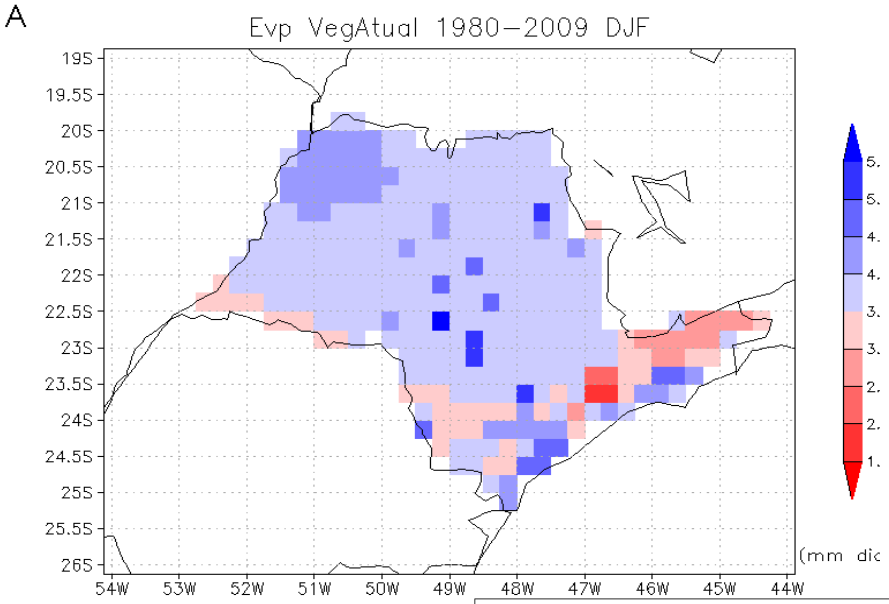
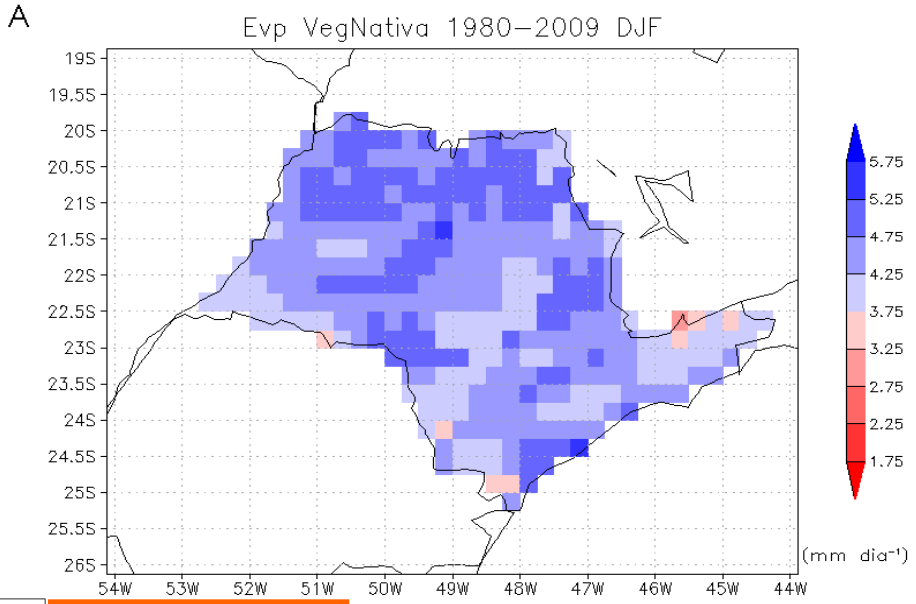
Mean climatological EVT (mm / day) with SiB2 model

Current and original vegetation MSc thesis (Martins, 2011)



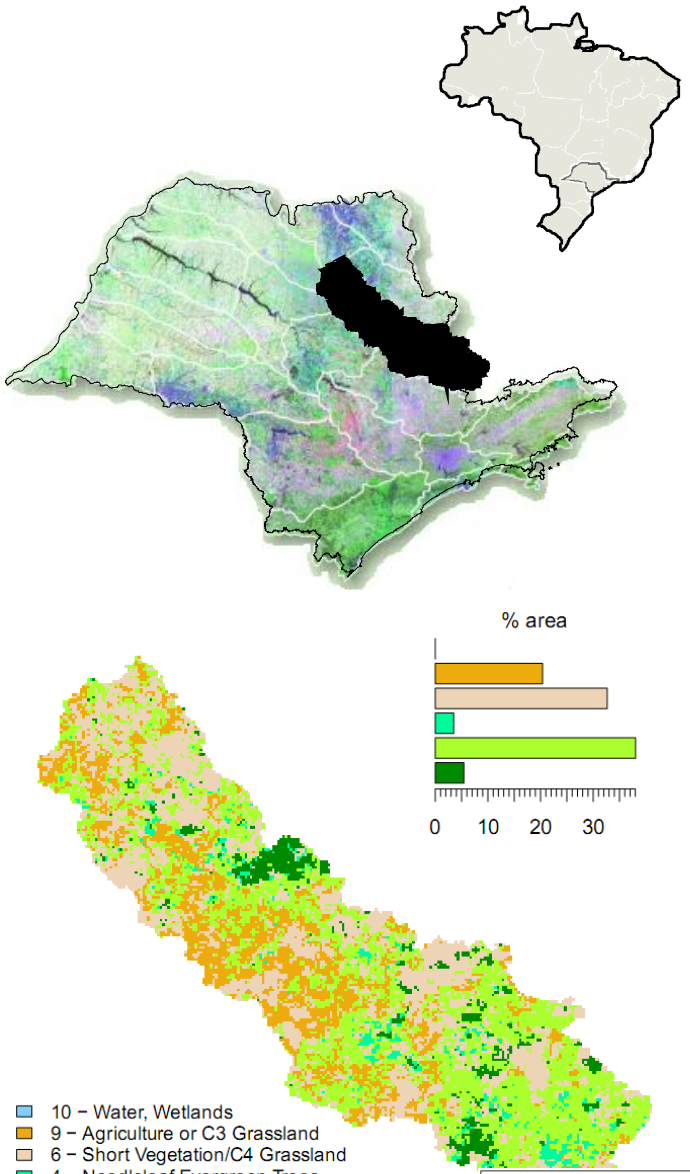


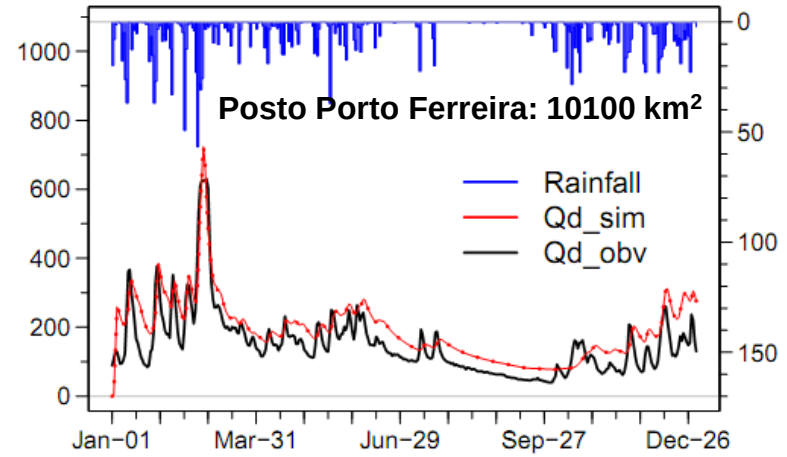


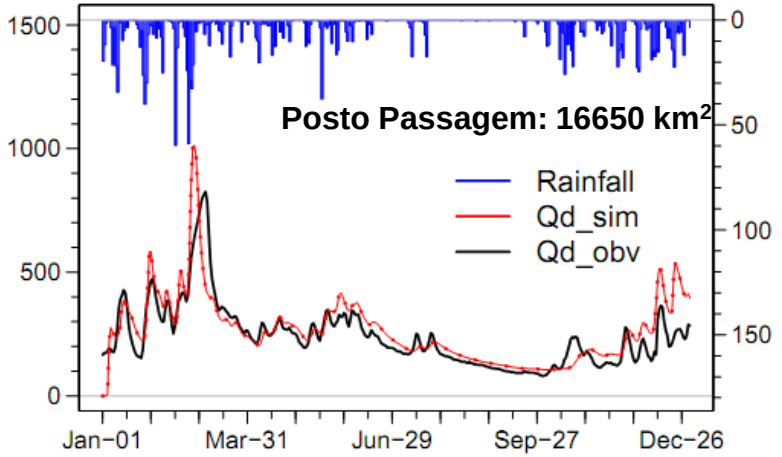


Hydrological and vegetation modelling (SiB2-DBHM model)

MogiGuaçú watershed (PhD thesis, Tatsch 2011)

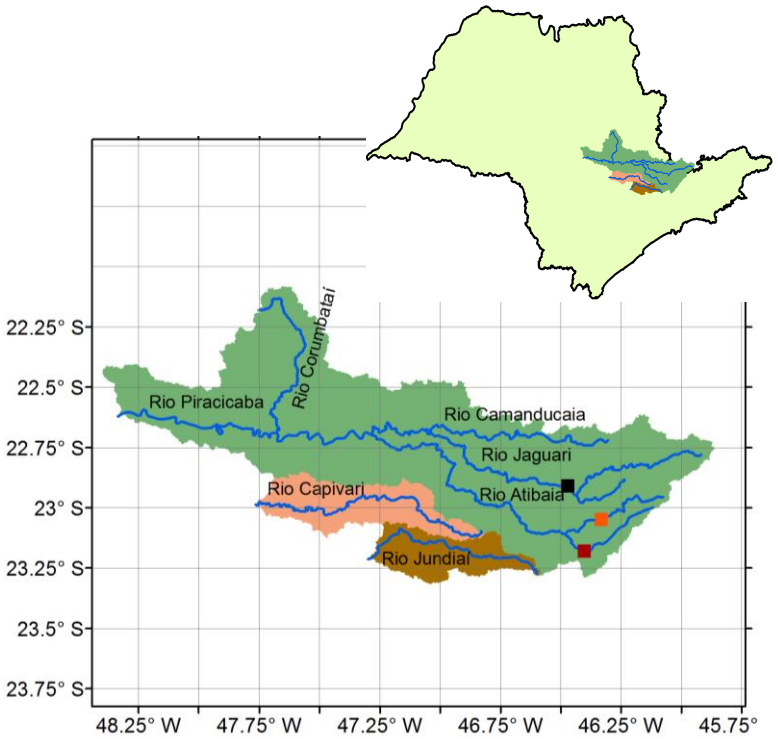


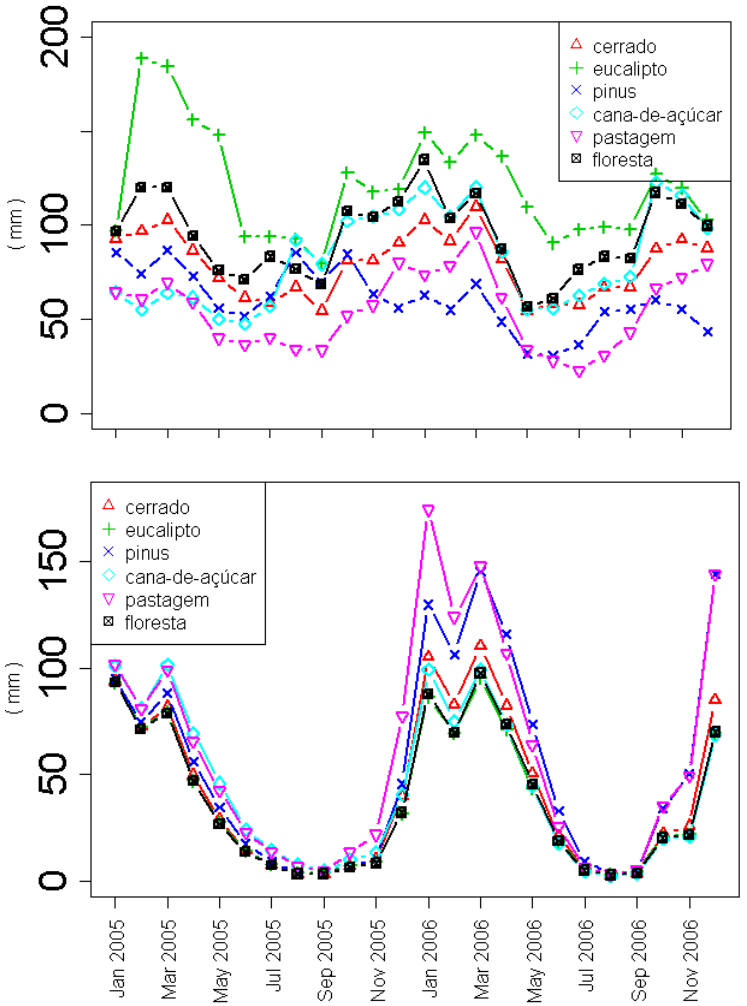




Hydrological and vegetation modelling
SWAT model (J. Mota, M.Queiroz, PhD thesis)

Mean EVT and discharge (mm per month) – preliminary results





Rivers Piracicaba-Capivari-Jundiaí (PCJ) watershed

Regional Carbon balance - Mass balance approach

$$\left.\frac{\partial C}{\partial t}\right|_V = \frac{\partial}{\partial t}\iiint_V \rho\chi dV = -\iint_S \rho\chi \boldsymbol{u}\,\boldsymbol{n} dS + \left.\frac{\partial C}{\partial t}\right|_{vertical} + F_{surf}$$

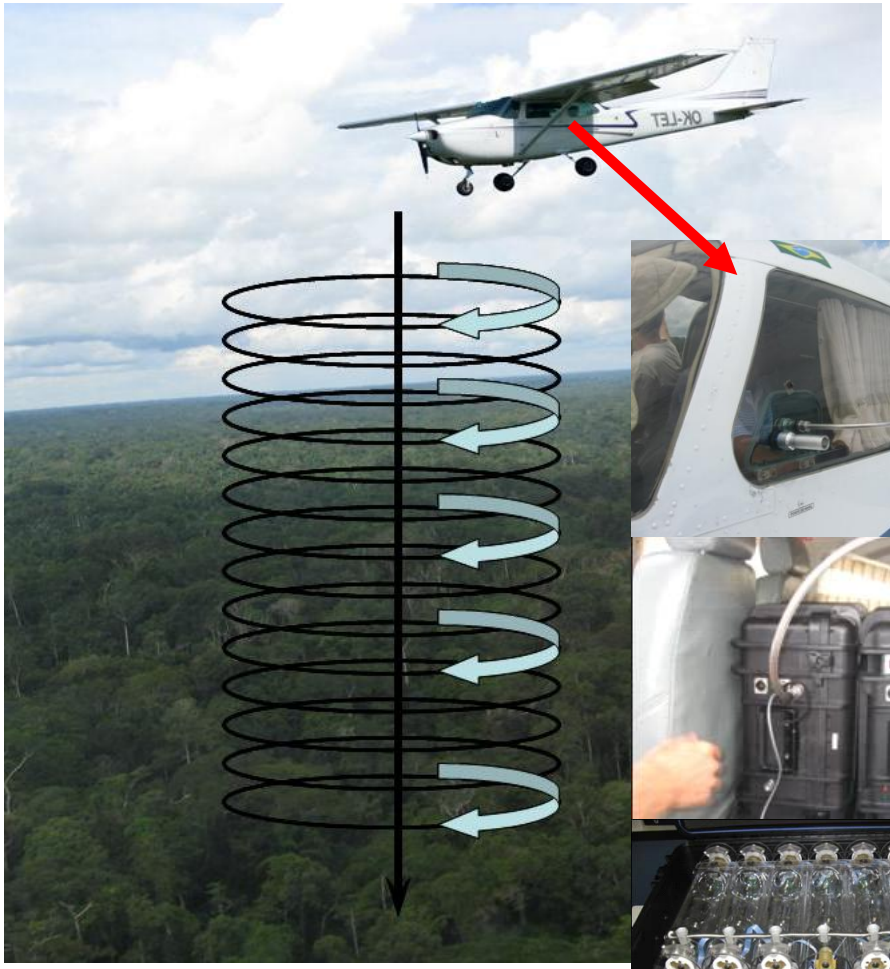
Wind basinwide transports

Sinks/sources of vegetation, rivers, burnings ...

- Other data assimilation methods

Column method
Amazonian Carbon Tracker

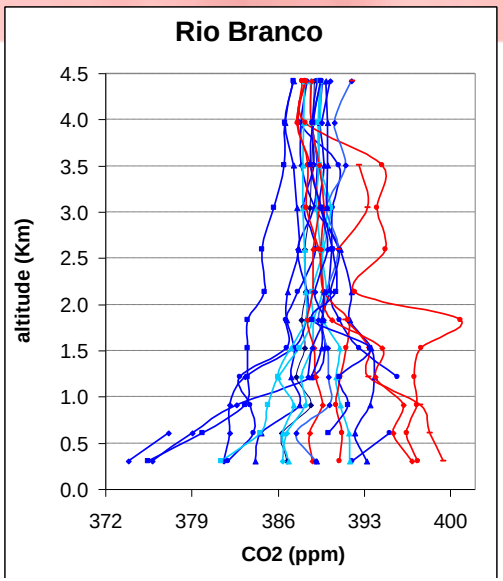
Aircraft based vertical profiles of CO_2, CO, CH_4 and $^{13}CO2$ IPEN laboratory (L. Gatti and students)

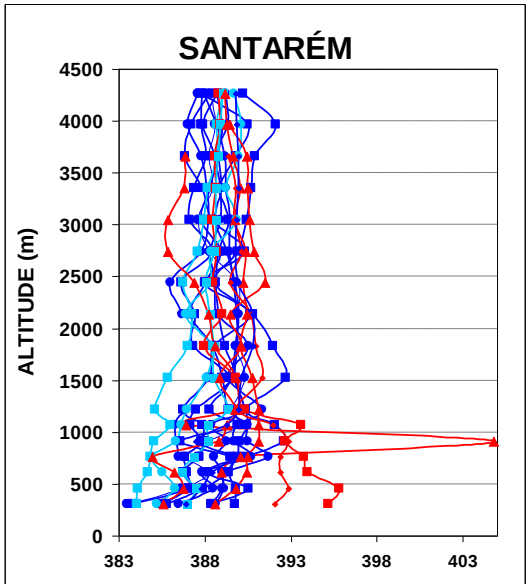


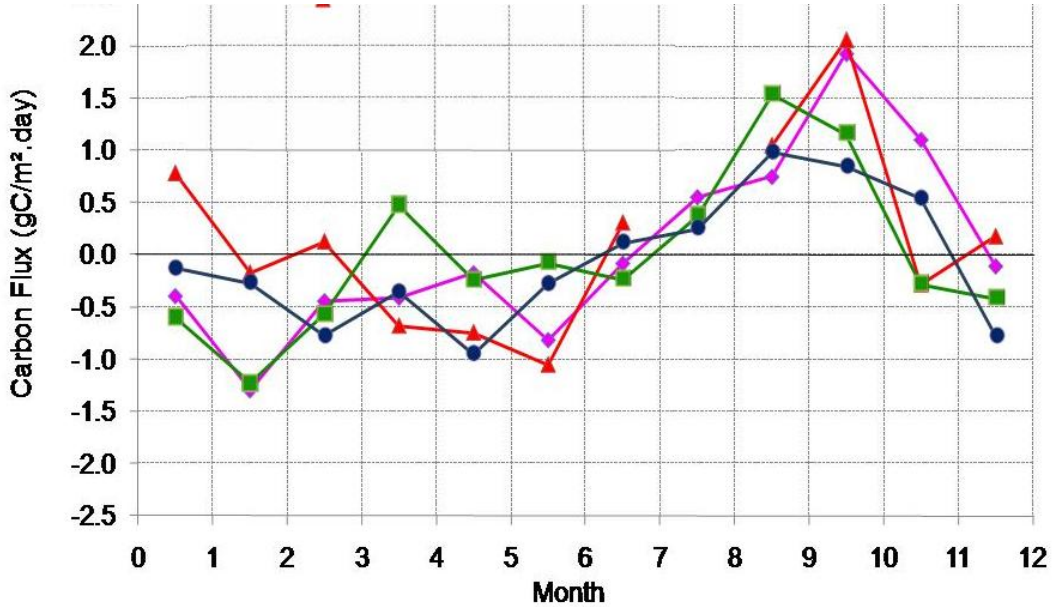
Downward sampling from 4 km height

Portable Compressor unit and Flask Unit

Carbon flux calculated with column method using vertical profiles (L. Gatti, 2011) (in prep)



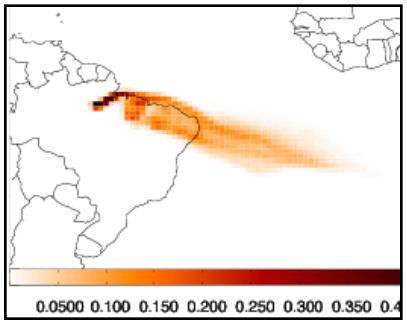




CarbonTracker Amazonia

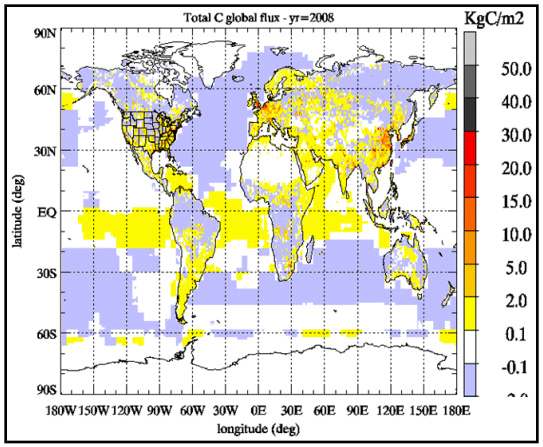
Usp,Cptec,Ipen,NOAA (M.Felippe,H.Rocha,SFreitas,LGatti,JMiller)

Forçantes Meteorologicas (Global forecast system GFS/NCEP 1º)

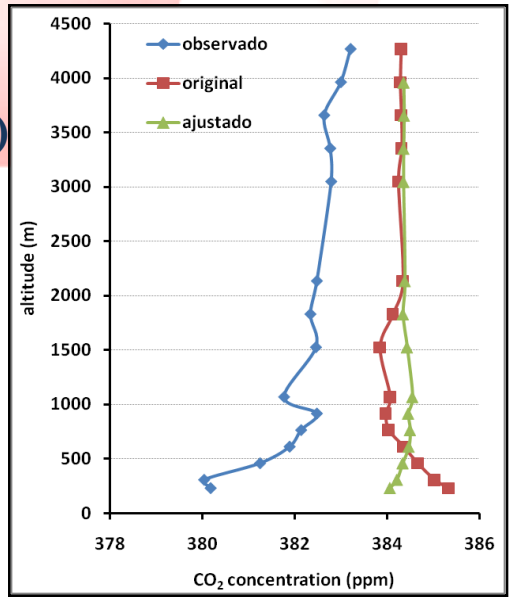


Footprint (ppm of CO2 /flux)

em pontos seletos na Amazonia
(FLEXPART submodel)



First guess Fluxo CO2 (NOAA, every 3h, 1º) from:
ecosistemas terrestres ,
combustiveis fosseis, oceano, fogo



CO2 concentration (calculada vs observada) em pontos seletos na Amazonia
Ajuste dos perfis verticais
Calculo fator de correção e reestimativa do fluxo

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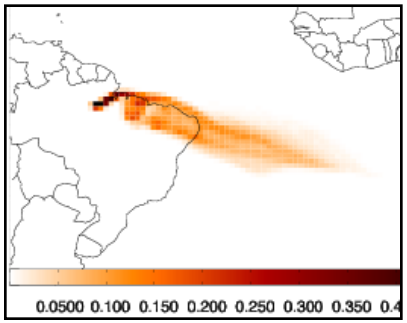

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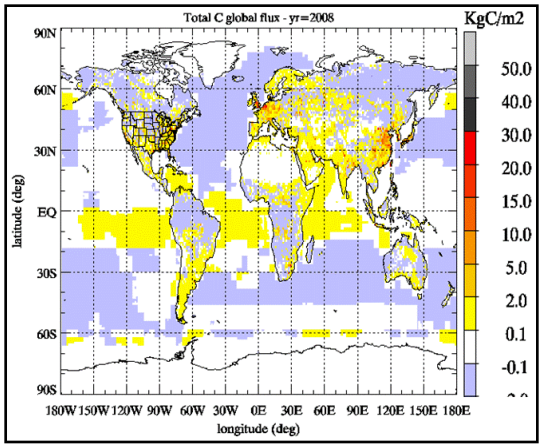

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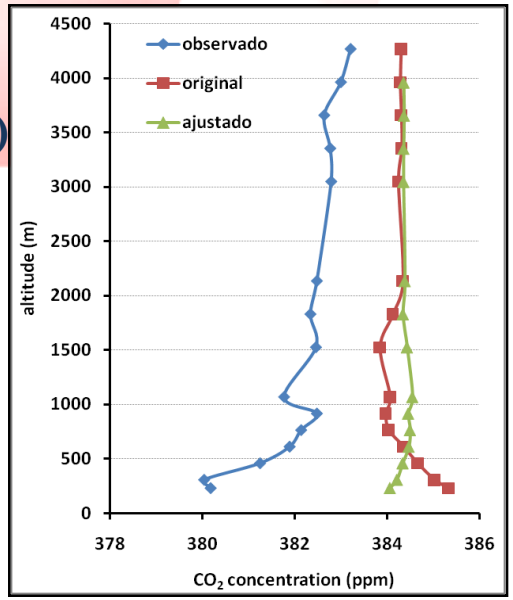
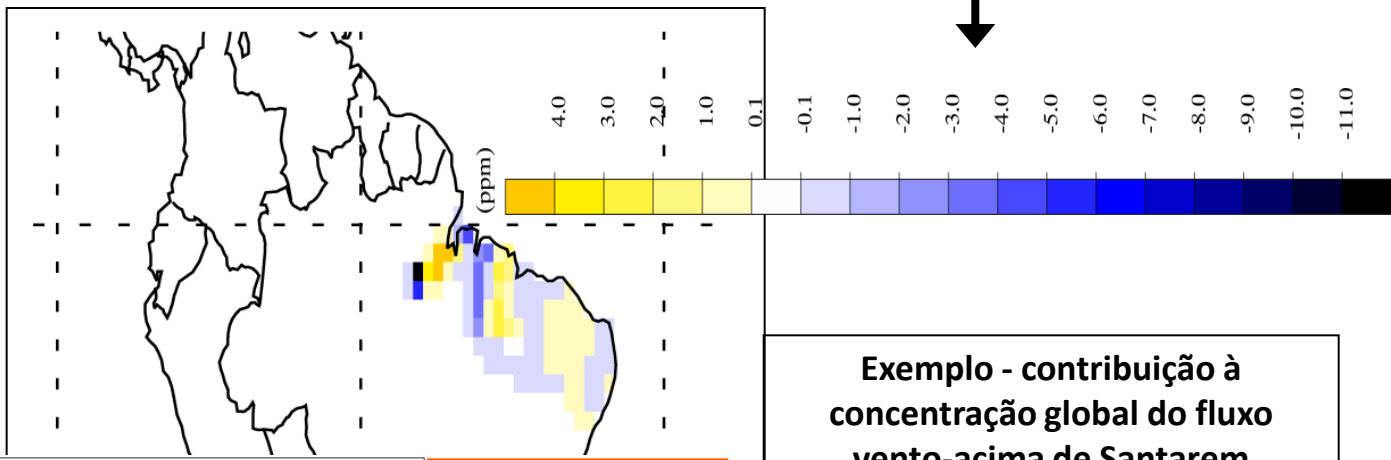


Concentração CO2 (calculada vs observada) em pontos seletos na Amazonia
Ajuste dos perfis verticais
Calculo fator de correção e reestimativa do Fluxo de CO2



Exemplo - contribuição à concentração global do fluxo vento-acima de Santarem

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