

**Observational network and hydrological
modelling to address water environmental
services in watershed scale
in Brazil**

TERENO conference: Bonn, Germany 30Sep2014

Humberto da Rocha & collaborators



Universidade de São Paulo
B R A S I L

Laboratório de Clima e
Biosfera – IAG / USP

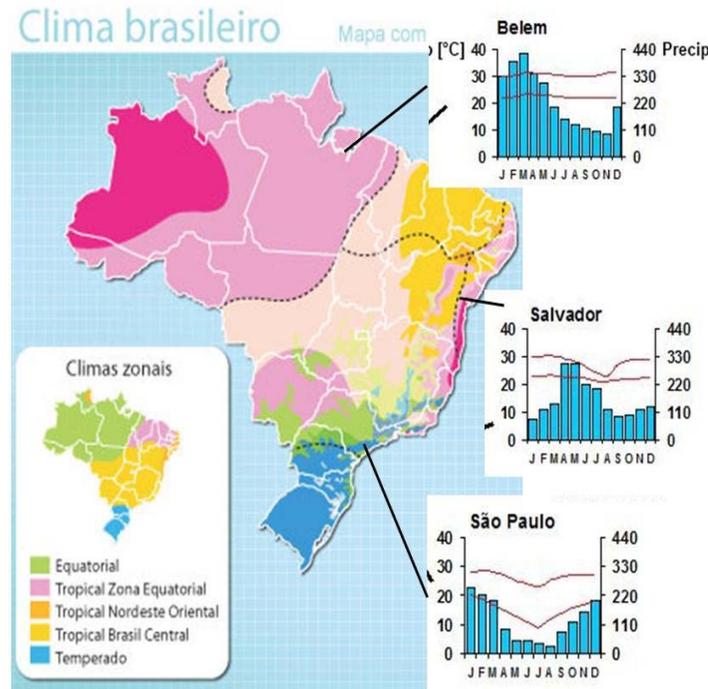
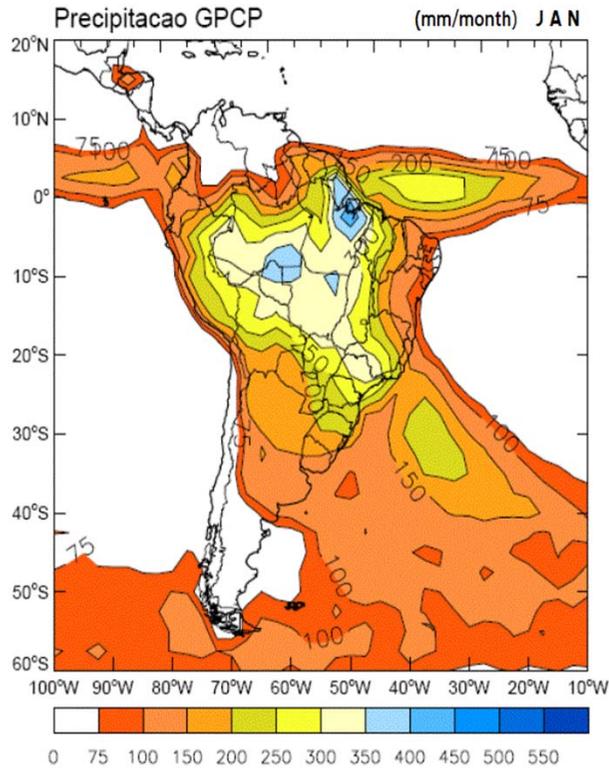
Outlook

Our previous work running micromet field sites

Where we are and where we go

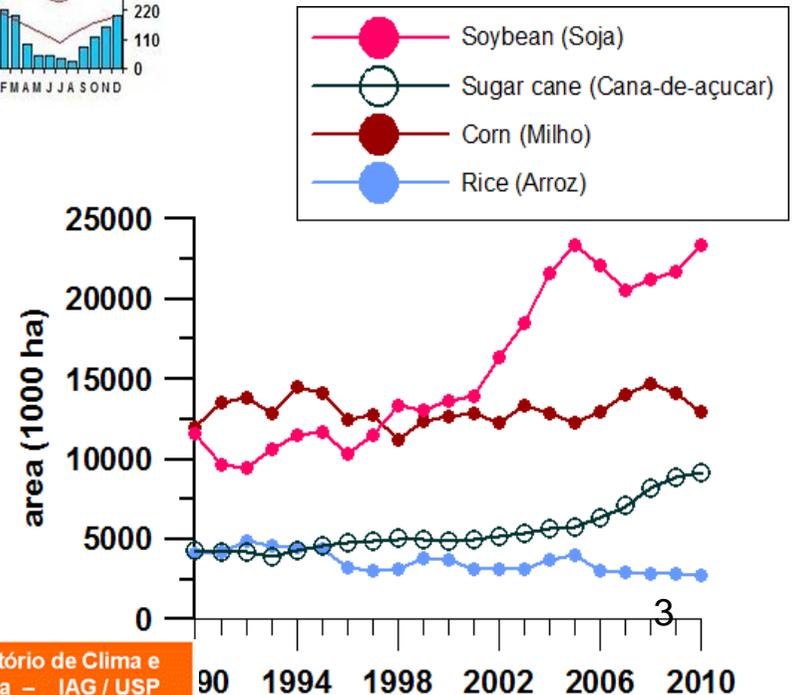
- 1) help investigation in places with issues of water security
- 2) install a network of weather and soil sensors, to help
 - i) provide targeted measurements to be incorporated into land flux, hydrological and atmospheric models
 - ii) understanding the watershed functionality
 - iii) help quantifying the environmental services

Brazil: climate and crop production

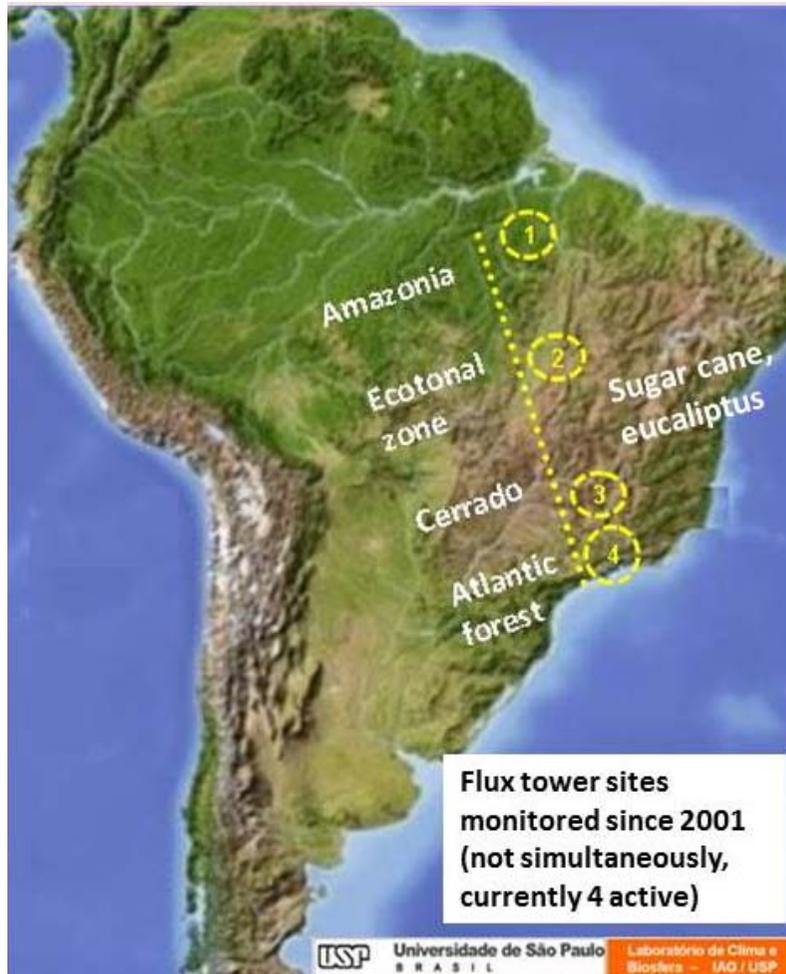


18% of global fresh water

Planted area of major annual crops

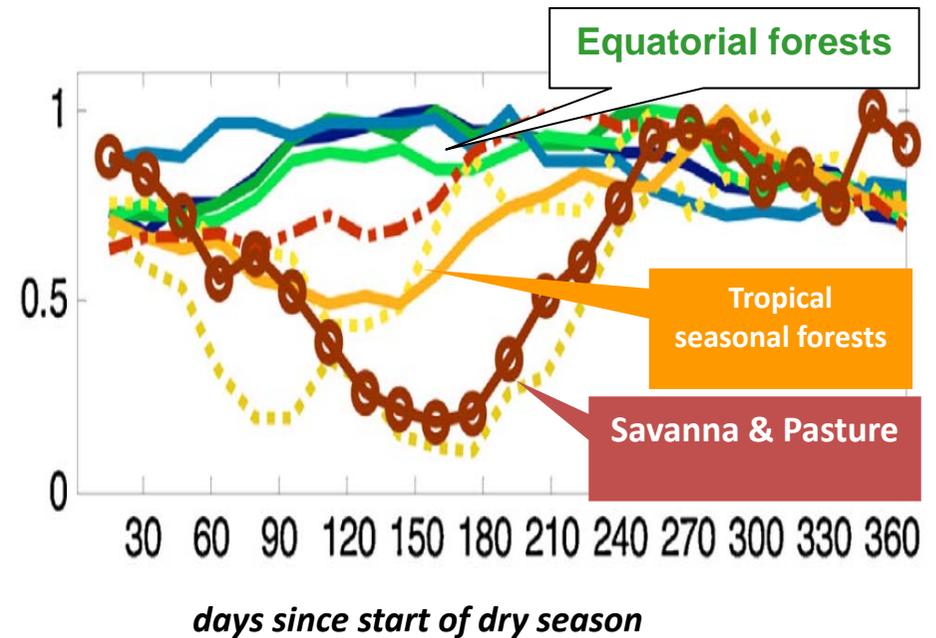


1. Seasonal variability of GPP as estimated with NEE - Rh



flux tower sites across a transition of biomes to measure surface-atmosphere CO₂ and water exchanges

Gross Ecosystem Productivity (fraction of max GEP)



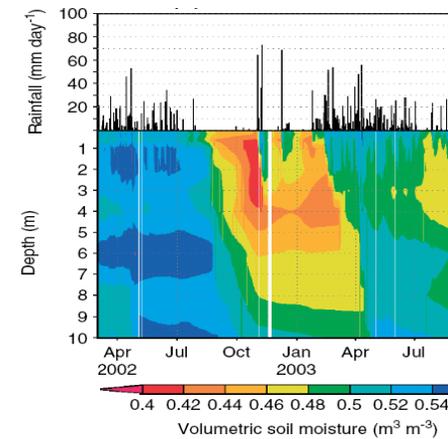
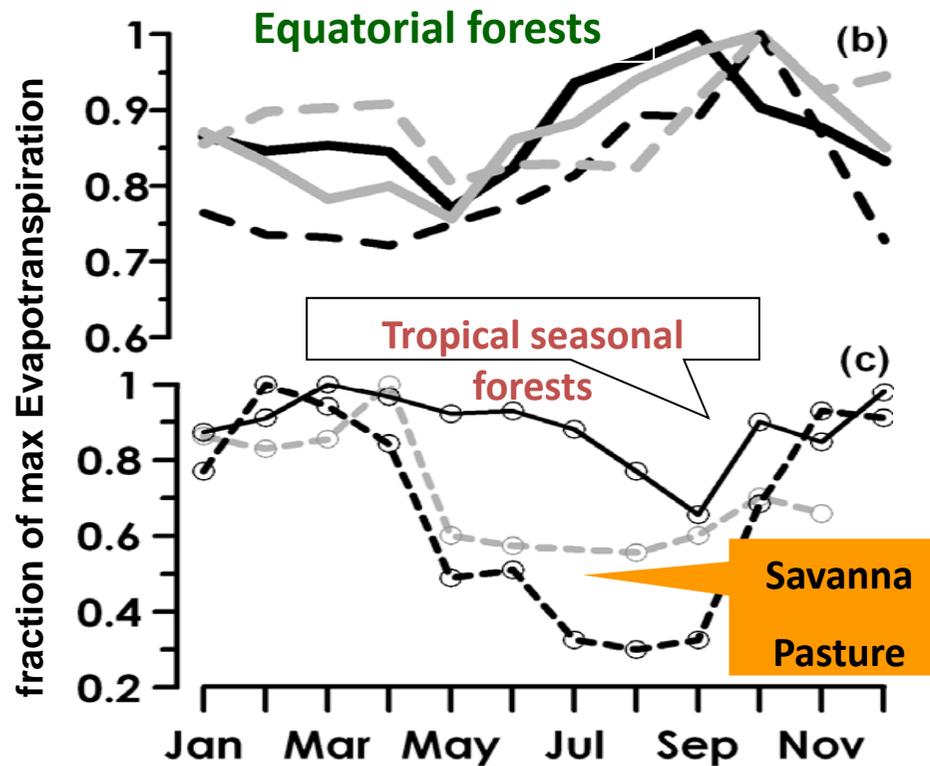
Agricultural and Forest Meteorology

journal homepage: www.elsevier.com/locate/agrformet

What drives the seasonality of photosynthesis across the Amazon basin? A cross-site analysis of eddy flux tower measurements from the Brasil flux network

Natalia Restrepo-Coupe^{a,b}, Humberto R. da Rocha^c, Lucy R. Hutyrá^e, Alessandro C. da Araujo^{l,k}, Laura S. Borma^o, Bradley Christoffersen^a, Osvaldo M.R. Cabral^l, Plínio B. de Camargo^b, Fernando L. Cardoso^r, Antonio C. Lola da Costa^p, David R. Fitzjarrald^f, Michael L. Goulden^l, Bart Kruijth^h, Iair M.F. Maia^{l,d}, Yadvinder S. Malhi^m, Antonio O. Manzi^l, Scott D. Miller^f, ...

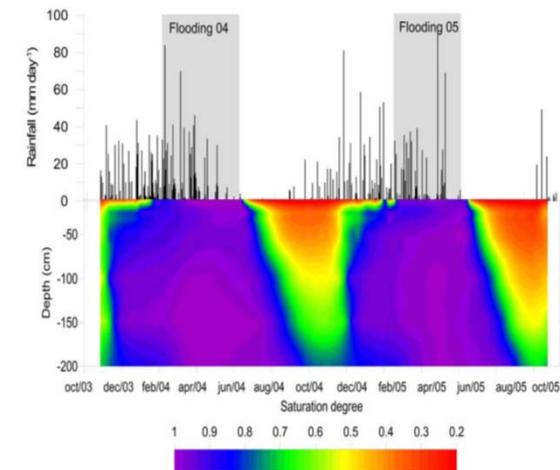
2. Seasonal variability of evapotranspiration and soil moisture patterns



HYDROLOGICAL PROCESSES
Hydrol. Process. 20, 2477–2489 (2006)
 Published online in Wiley InterScience
 (www.interscience.wiley.com) DOI: 10.1002/hyp.6211



Soil moisture dynamics in an eastern Amazonian tropical forest



JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 114, G01003, doi:10.1029/2007JG000641, 2009



Atmosphere and hydrological controls of the evapotranspiration over a floodplain forest in the Bananal Island region, Amazonia

L. S. Borma,¹ H. R. da Rocha,¹ O. M. Cabral,² C. von Randow,³ E. Collicchio,⁴

JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 114, G00B12, doi:10.1029/2007JG000640, 2009

Patterns of water and heat flux across a biome gradient from tropical forest to savanna in Brazil

Humberto R. da Rocha,¹ Antonio O. Manzi,² Osvaldo M. Cabral,³ Scott D. Miller,⁴
 Michael L. Goulden,⁵ Scott R. Saleska,⁶ Natalia R.-Coupe,⁶ Steven C. Wofsy,⁷



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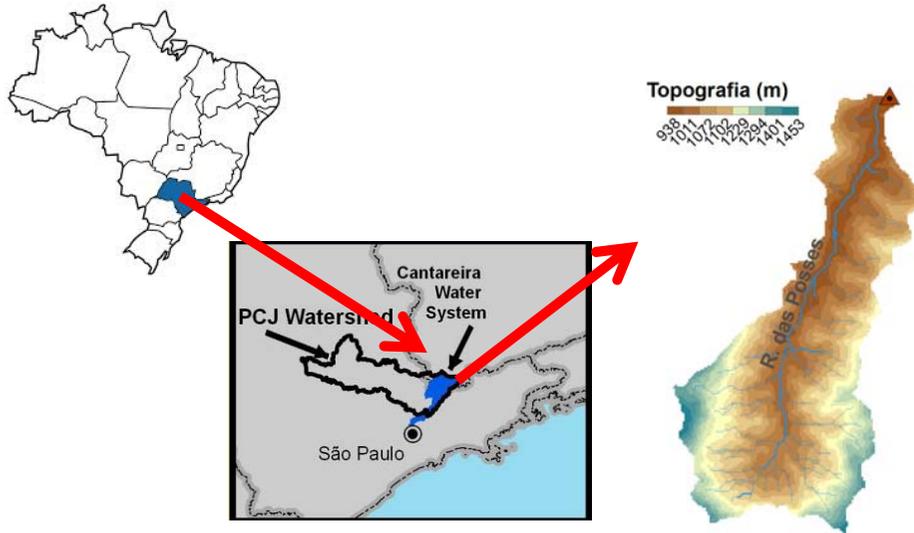
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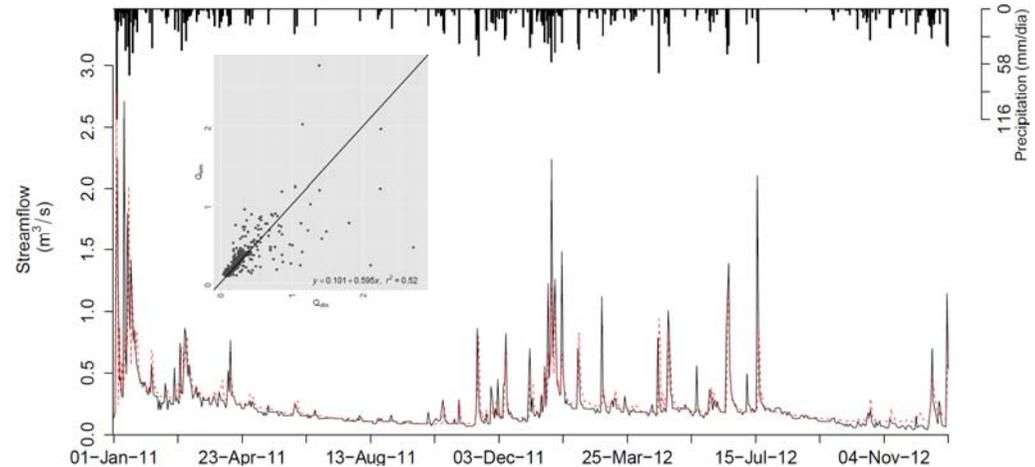
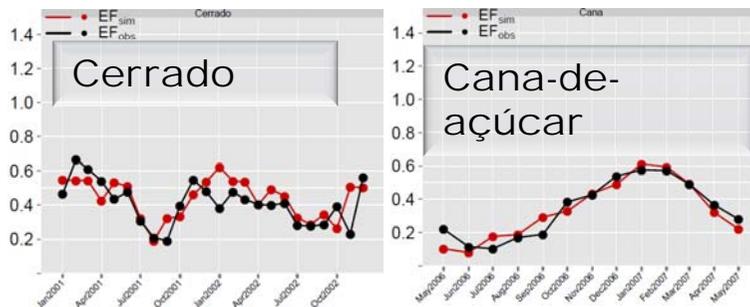
Modelling streamflow (Mota 2014, PhD thesis, USP)



Posses creek watershed (12 km²)

SWAT hydrological model
Streamflow calibrated (2 yrs data)
Evapotranspiration calibrated via evaporative fraction

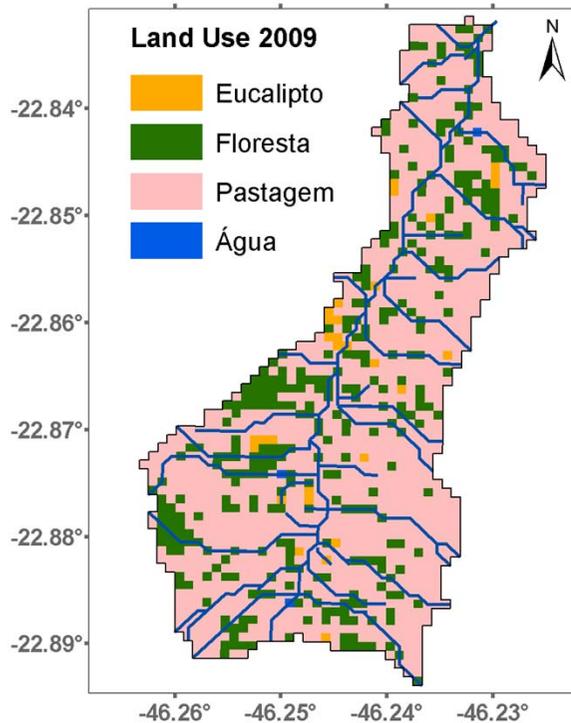
Evap fraction calibration (mean monthly)



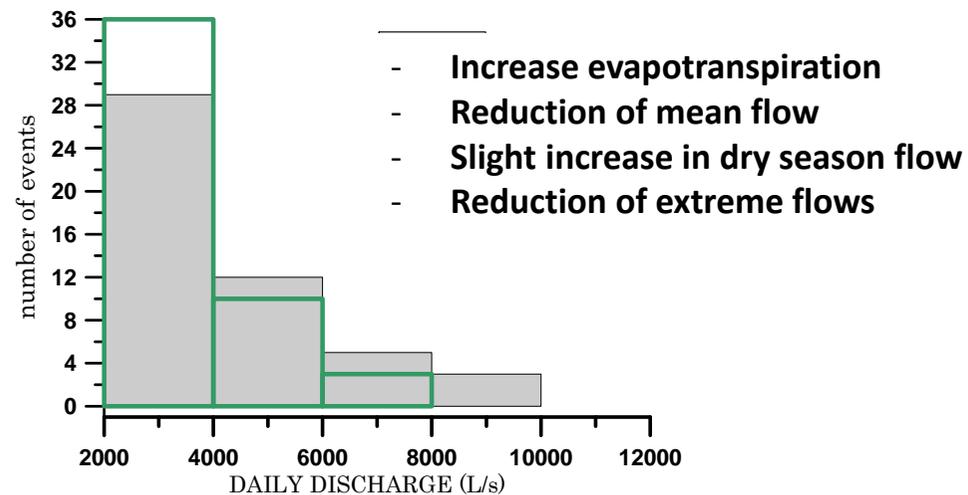
Stream flow calibration (daily)

Modelling streamflow

Modelling scenarios: reforestation of riparian zones



Scenarios (% reforested area)	Q1% (Ls ⁻¹)	Q_mean (Ls ⁻¹)	Q99% (Ls ⁻¹)
current 2012= 22%	2595	76	7.7
30%	2482 (-4.3%)	69 (-9%)	7.6(-0.52%)
42%	2251 (-13.2%)	57 (-25%)	7.9(3.76%)
49%	2116 (-18.4%)	50 (-34%)	8.3 (8.6%)



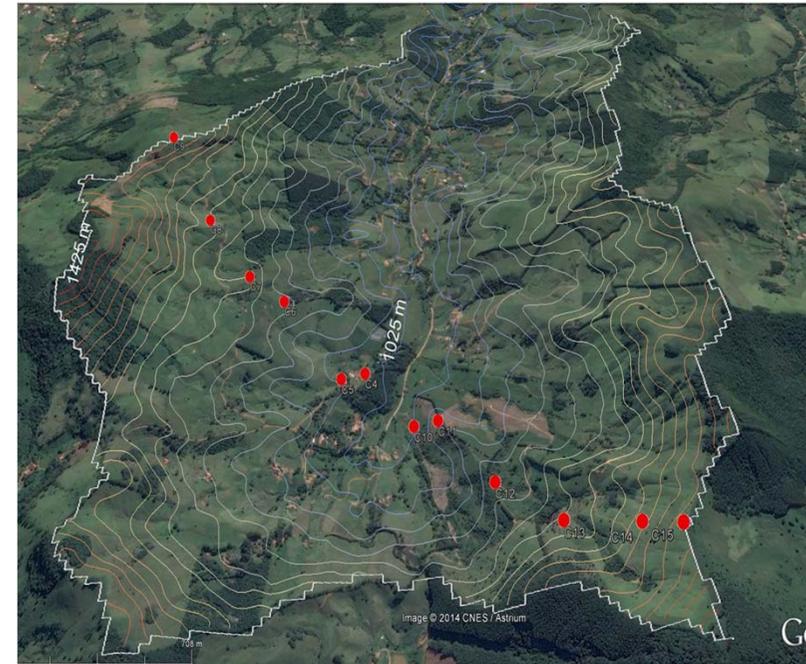
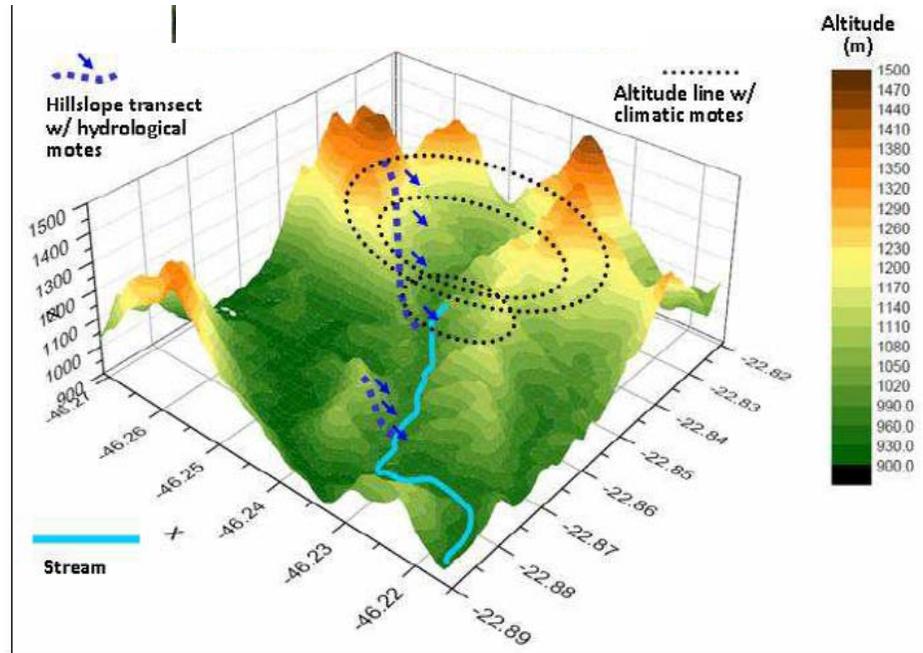
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Network: installation started 7 Sep 2014

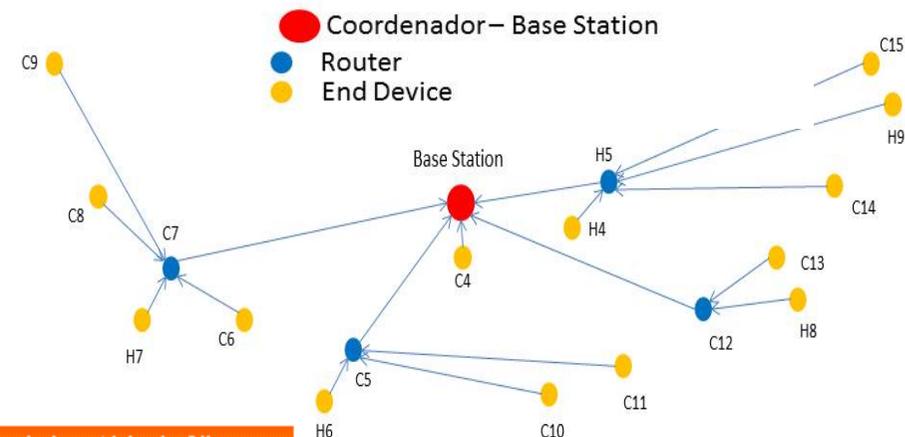
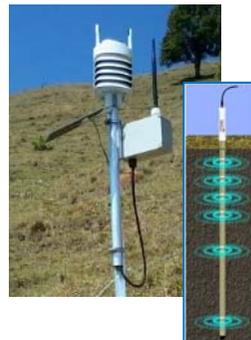


Data acquisition and transmission

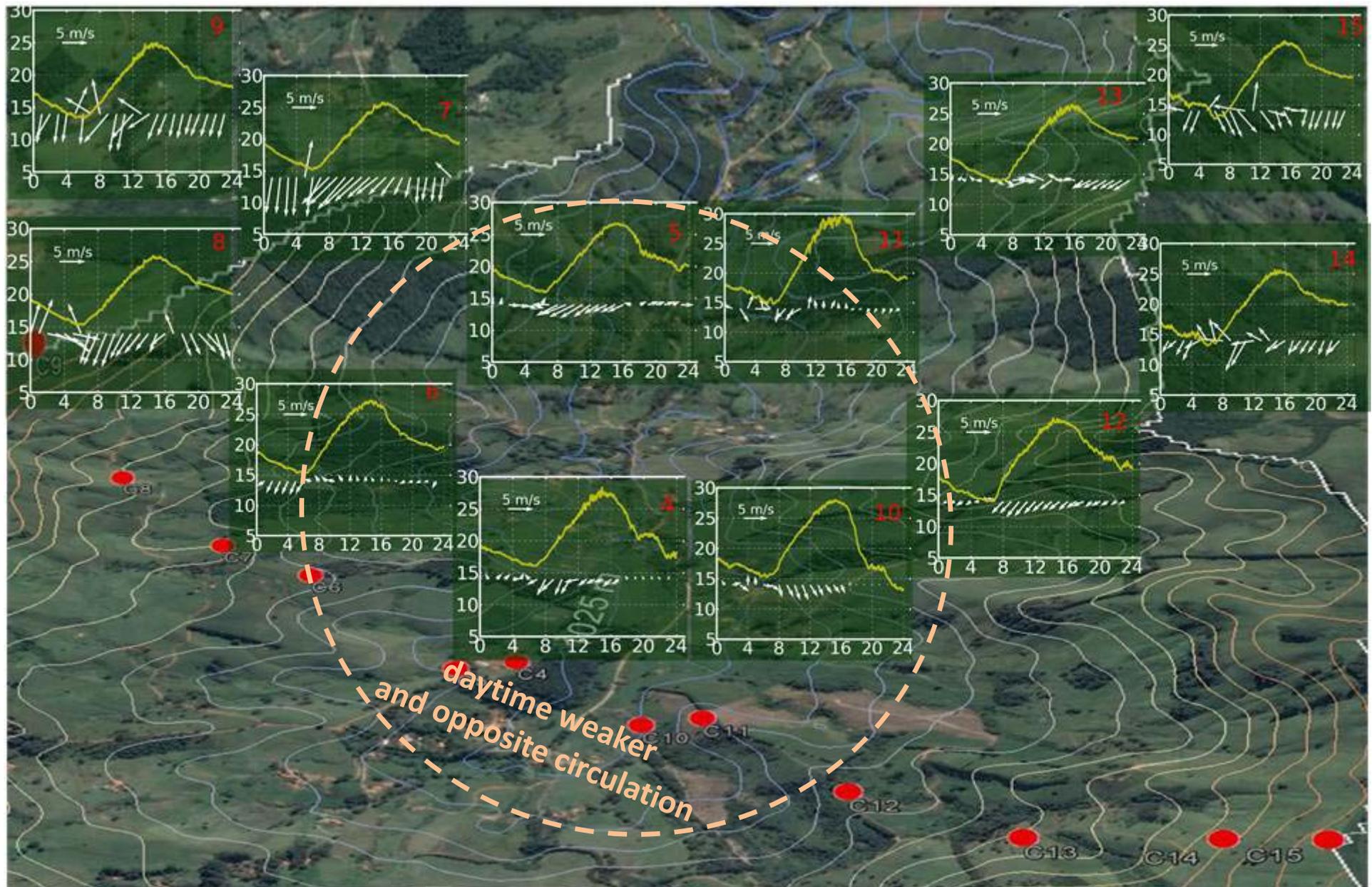
- ✓ Board control with SD Card
- ✓ Transceiver ZigBee
- ✓ Lithium Polymer Battery 3,7V
- ✓ solar Panel 2W

Sensors

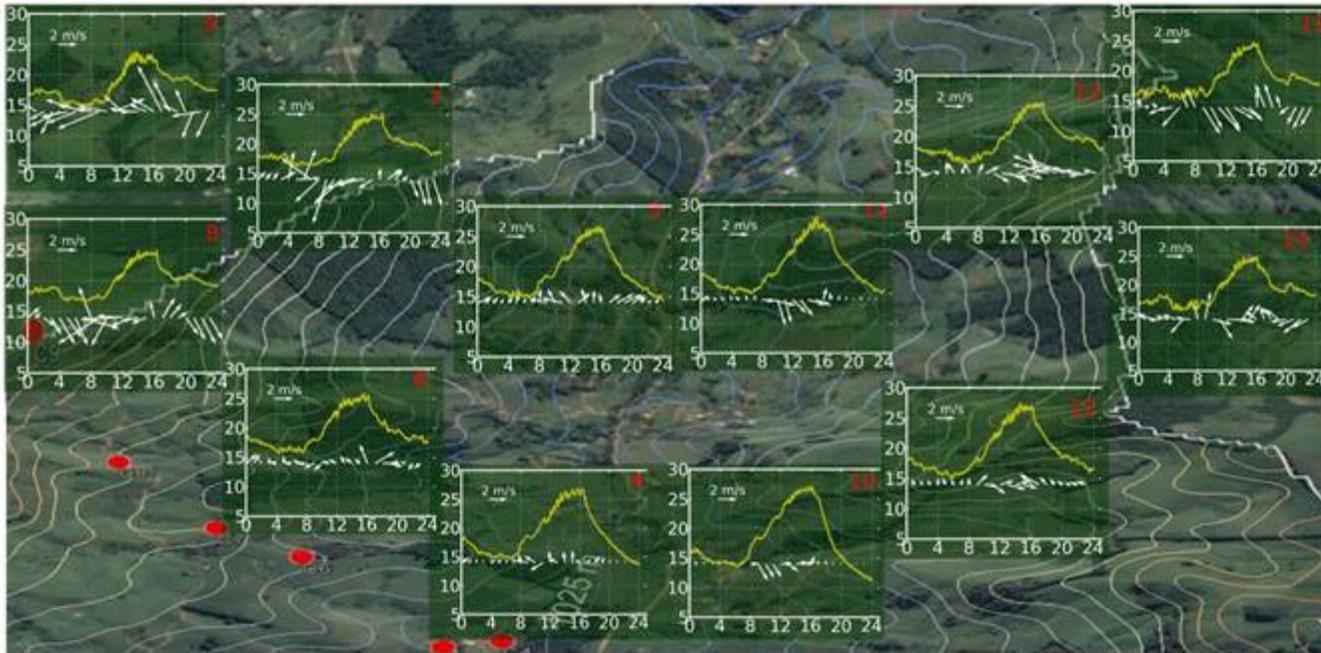
- ✓ Vaisalla WXT, Delta-T PR2



Air temperature and wind speed on 9 sep 2014



Air temperature on 8 sep 2014

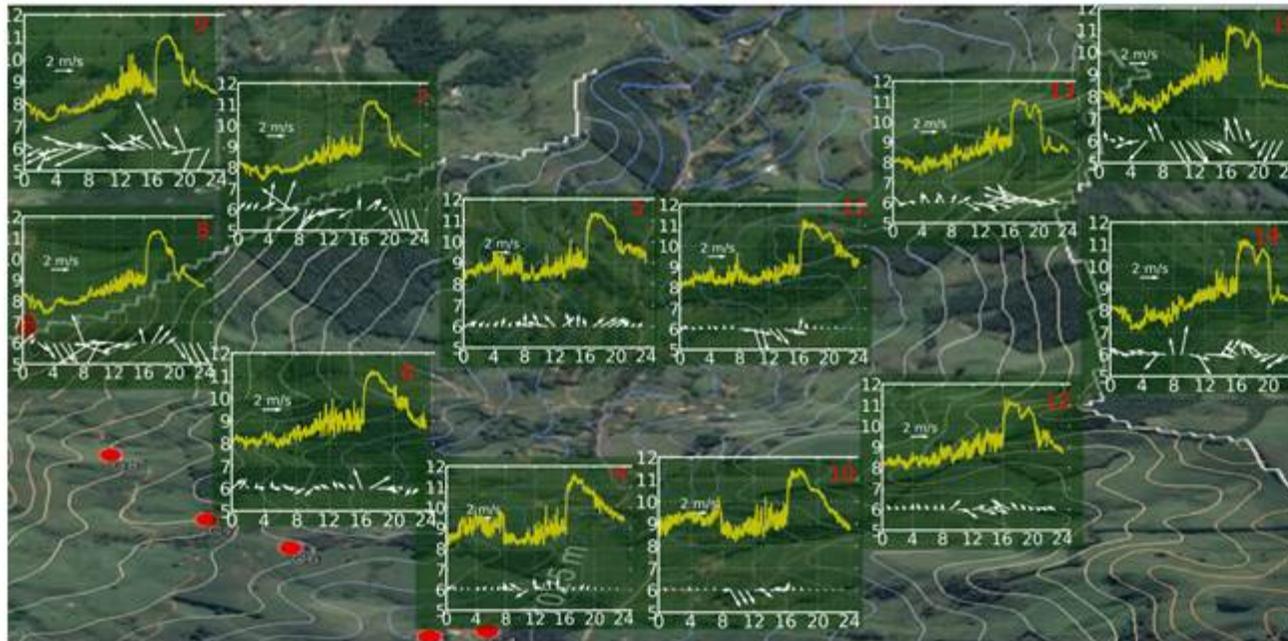


Mean hourly temperature (oC)

Deviation of mean hourly temperature (oC) from all stations

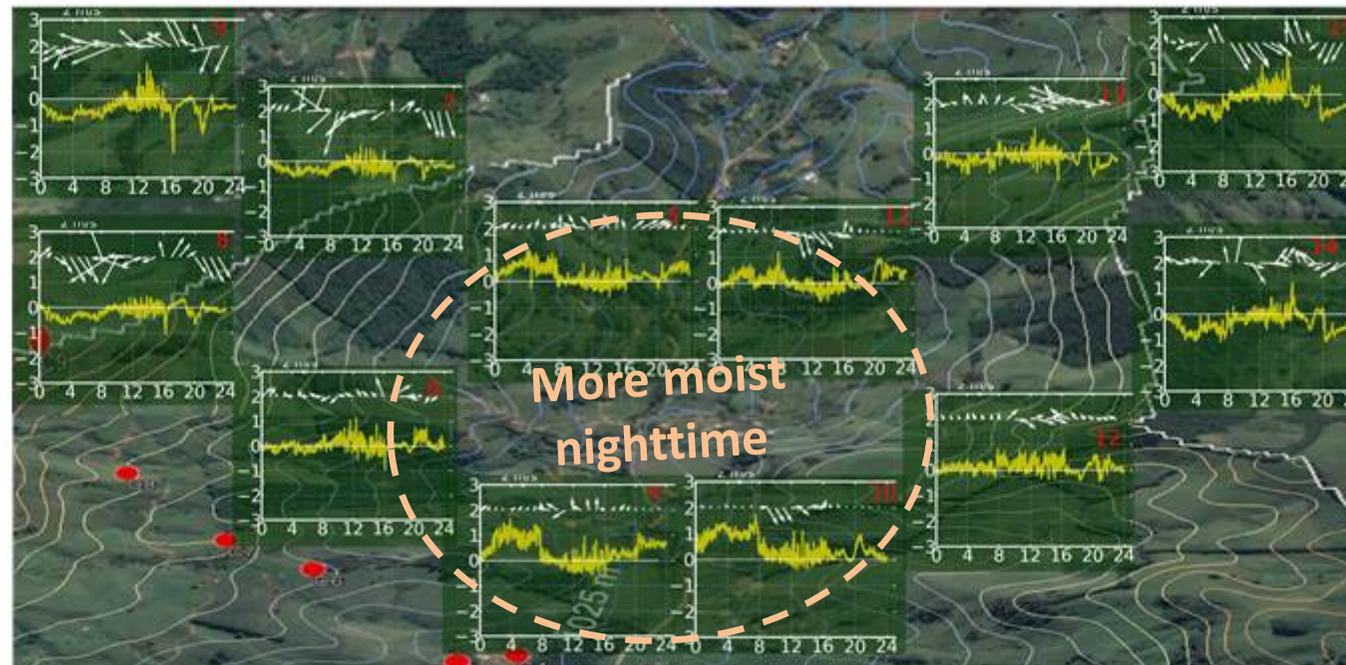


Air humidity on 8 sep 2014 (light rain at 16 h)



Mean hourly
specific humidity
(g/kg)

Deviation of
mean hourly
specific
humidity
(g/kg) from all
stations



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Thanks **humberto.rocha@iag.usp.br**