Flux Observations in Southern Brazil

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- Since 1994, the UFSM Micrometeorology group conducts surface flux observations in southern Brazil;

- The group is composed by 6 professors, 12 Doctorate and 15 Master students;

- Research focuses on observational and theoretical aspects of turbulent interactions between the surface and the atmosphere;

- Since 2005, an undergraduate Meteorology school exists in Santa Maria, leaded by the LμMet researchers;

- Other research fields are being implemented since then, specially on climatic interactions and mesoscale circulations;

- In both cases, the research focuses primarily on Southern South American problems.

Motivation

- Energy partition determination, including latent fluxes, important for hydrological purposes;
- Carbon flux observation, important for climatic change studies;
- Modeling: what is the role of the PBL in the development and evolution of the MCC (new).

Our experimental sites

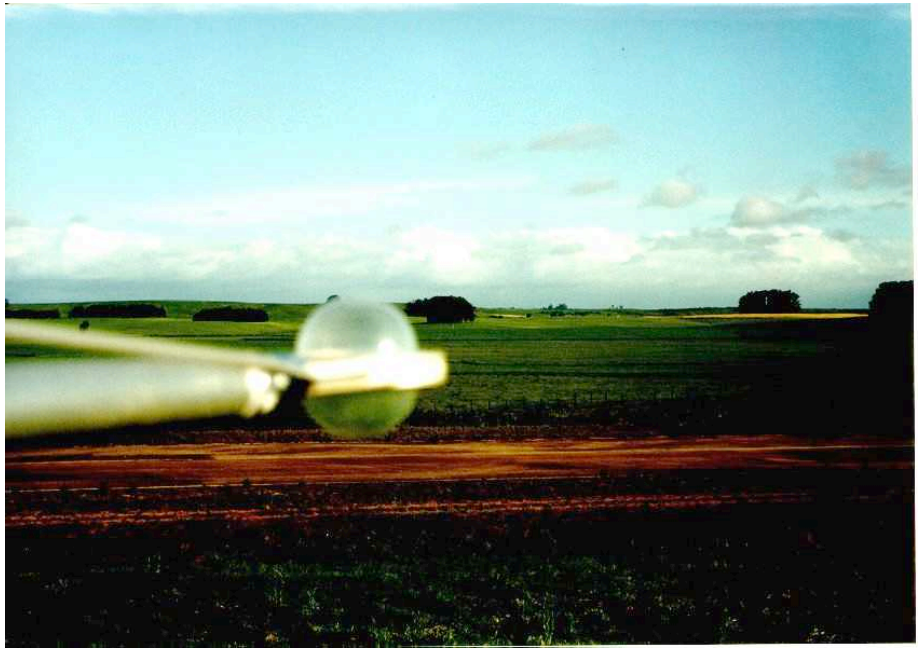
General information

- Rice – (Paraíso do Sul) 2003 -2006

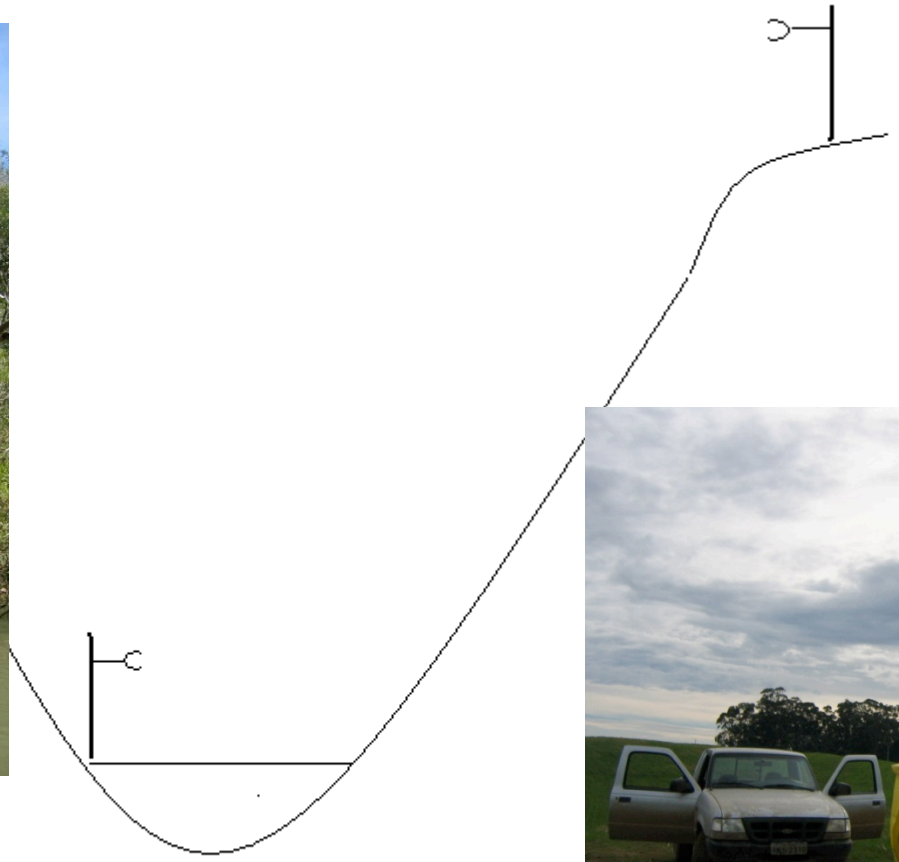
- Soy beam (Cruz Alta) 12/06 to 04/07

General information

- Complex terrain (NRS) since 11/2002 4 met stations + 3 campaigns (including soundings)
- Candiota – Typical Pampa site – since 2004. 3 met stations + 6 campaings. Continuously turbulent measurements after 4/08

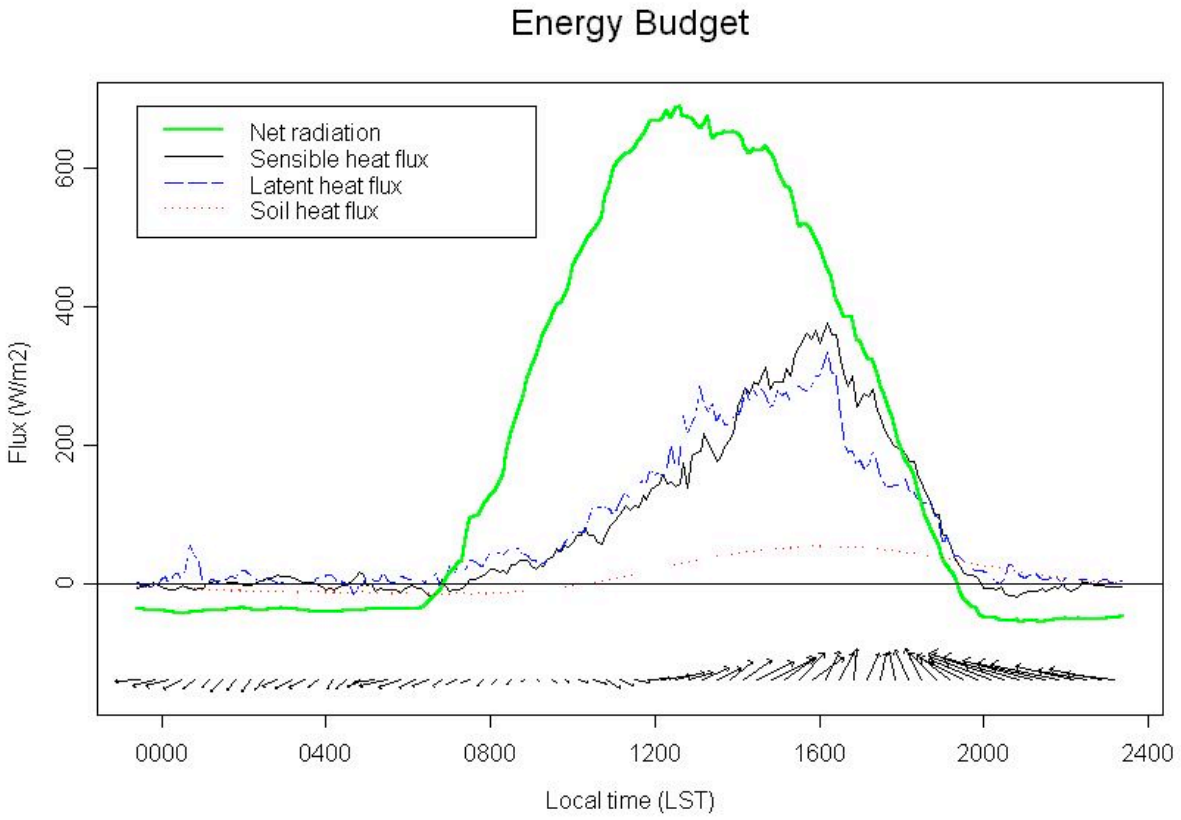


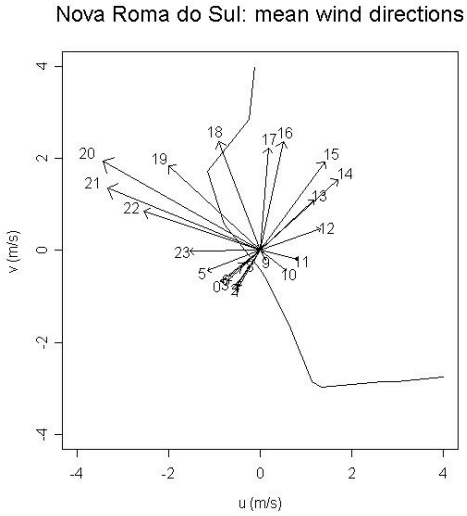
Some results – NRS – Complex terrain

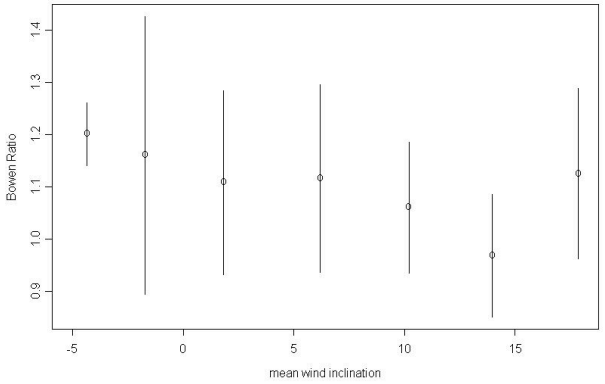


Main results

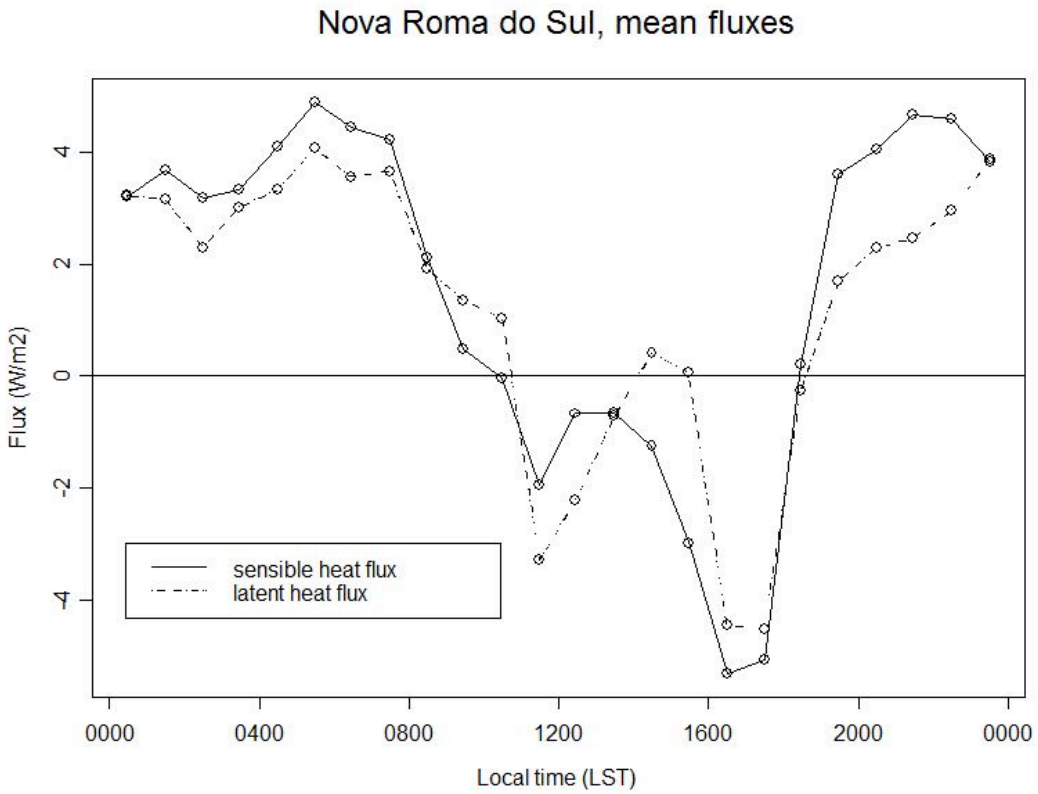
Acevedo, O. C., Moraes, O. L. L., Silva, R., 2002: Turbulence observations at the edge of a cliff. Proceedings, *15th Symp on Boundary Layers and Turbulence*, Wageningen, The Netherlands, Amer. Meteor. Soc., 592-595.







Mean daily cycle

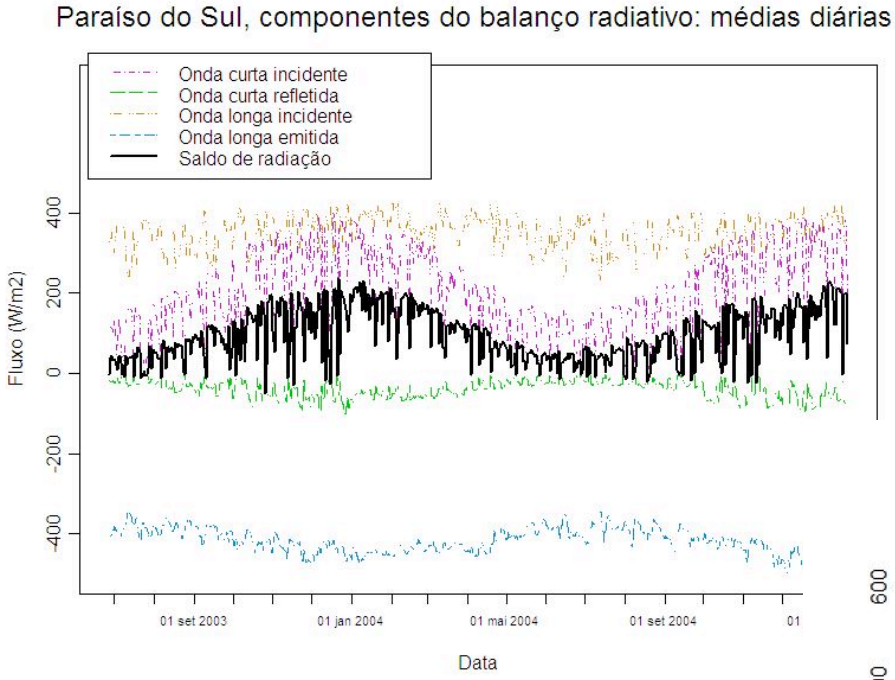


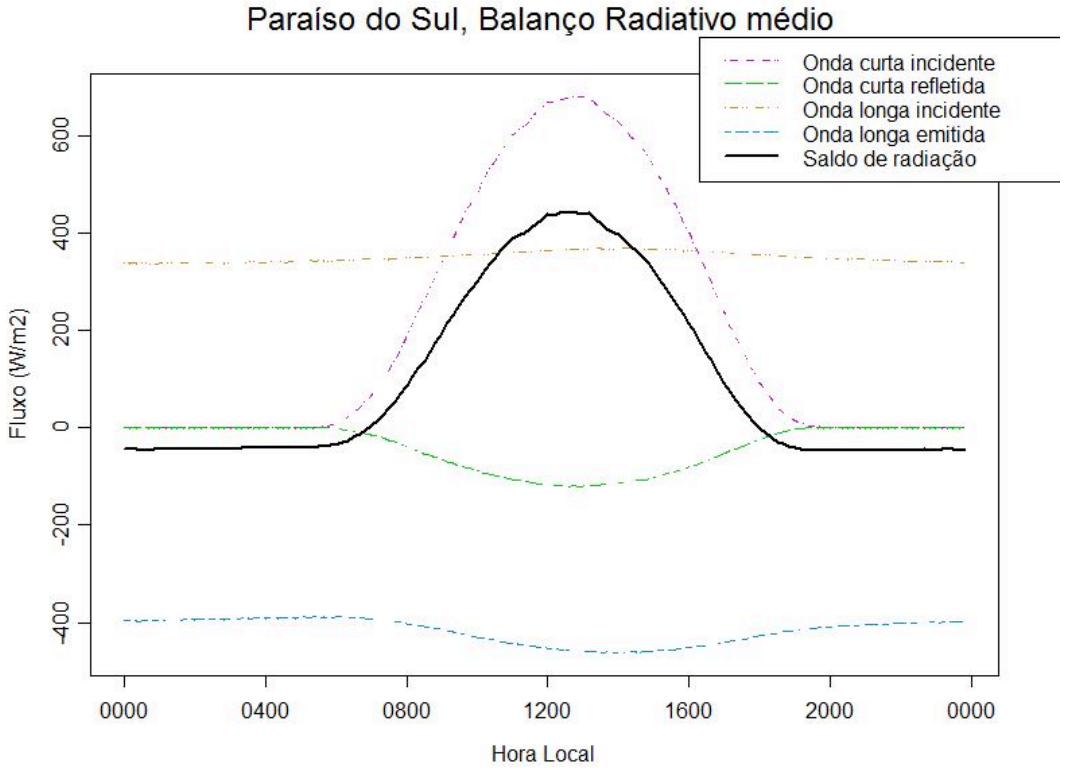
Mean turbulent fluxes over 12 days of observations. Sensible and latent heat fluxes are directed toward the river during daytime and from the river at night, and they are controlled by differences between water and air temperatures. Local scalar budgets show that daytime warming and moistening rates above the river are controlled by local transport from the riverbanks.

JAM (**46**, 2007)

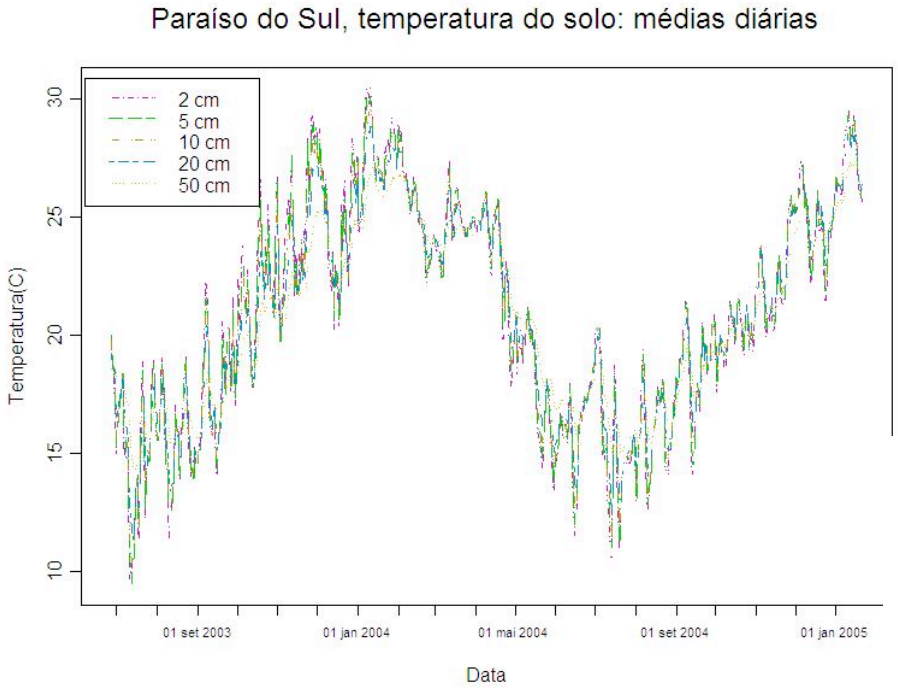
Some Results - Paraíso do Sul, RS, 2003 to 2006

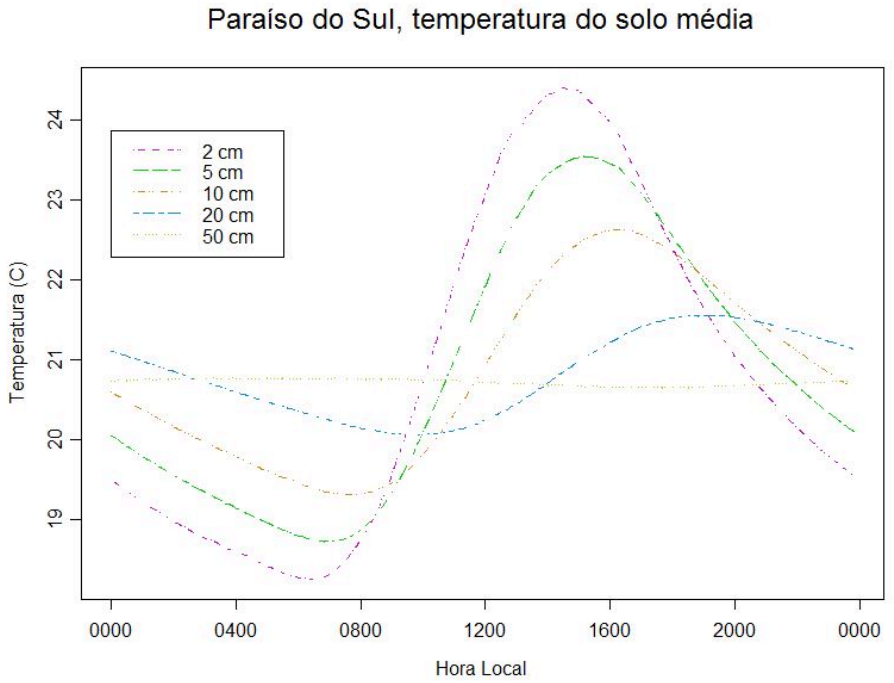
Radiation budget: temporal evolution



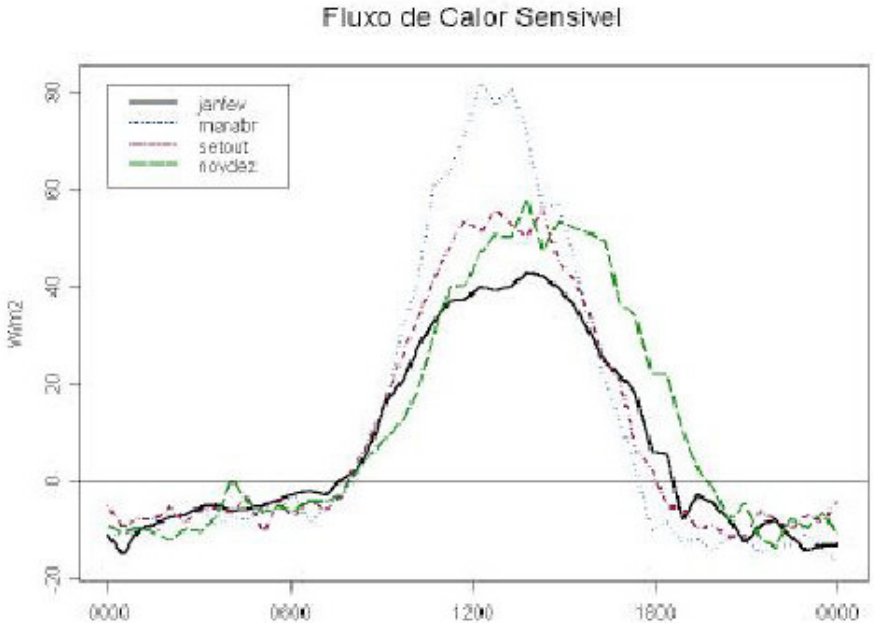


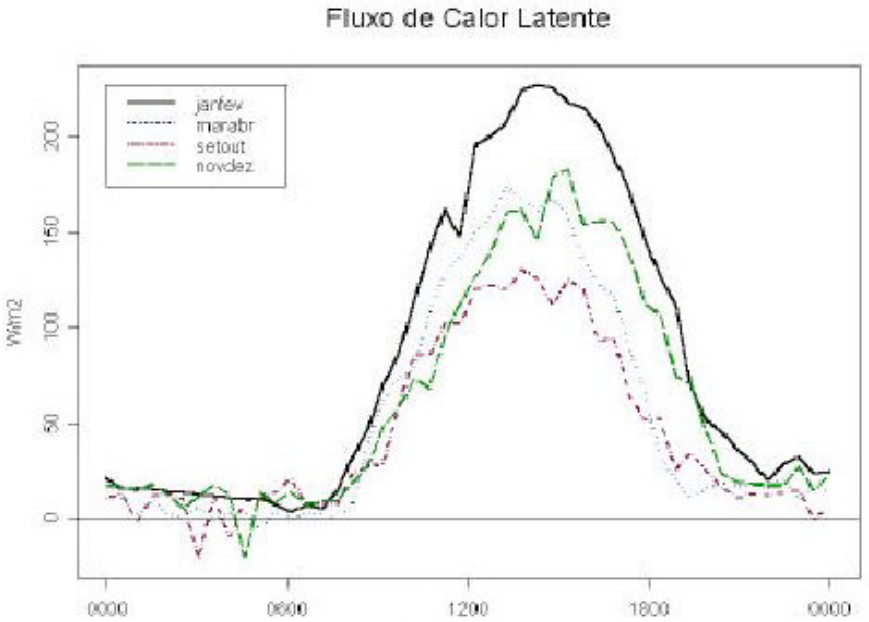
Temporal evolution of soil temperature

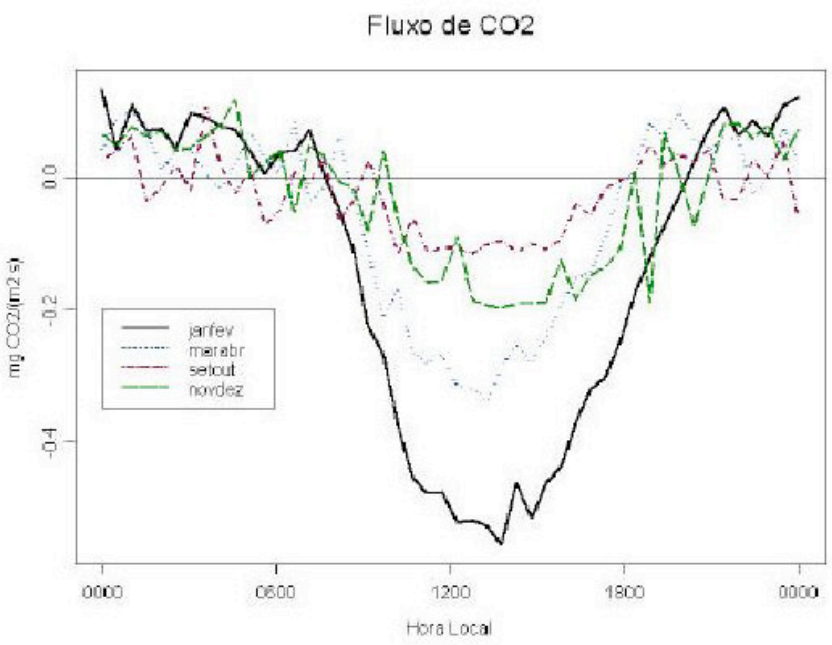


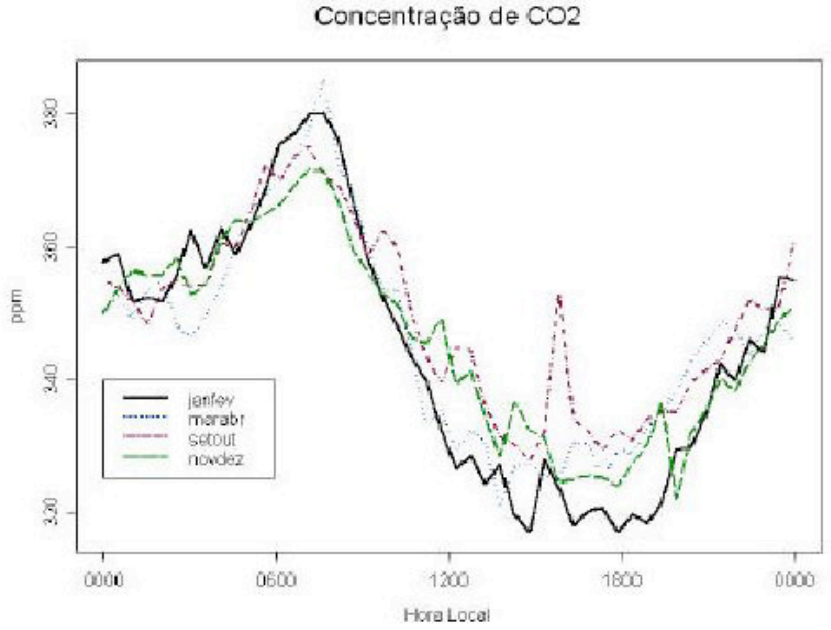


Turbulent fluxes: average daily cycle





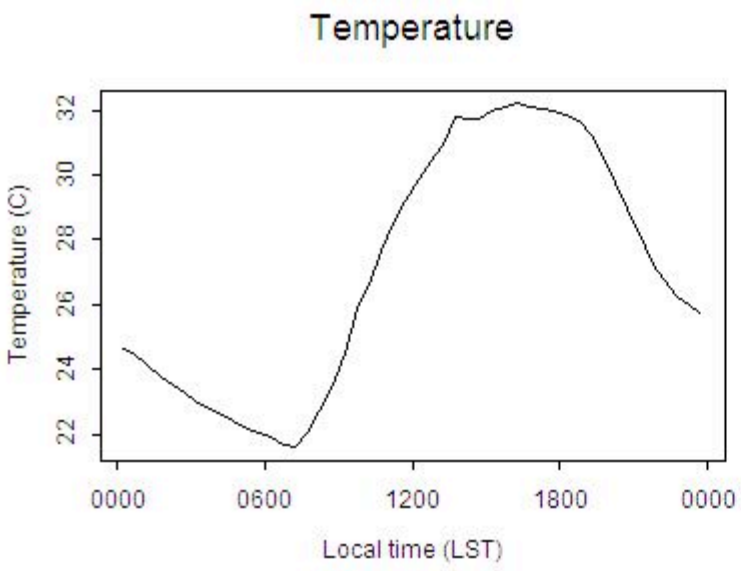


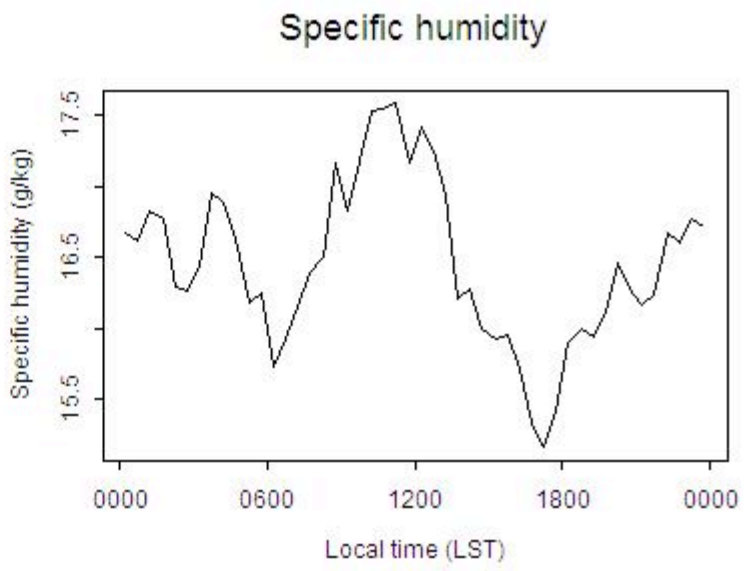


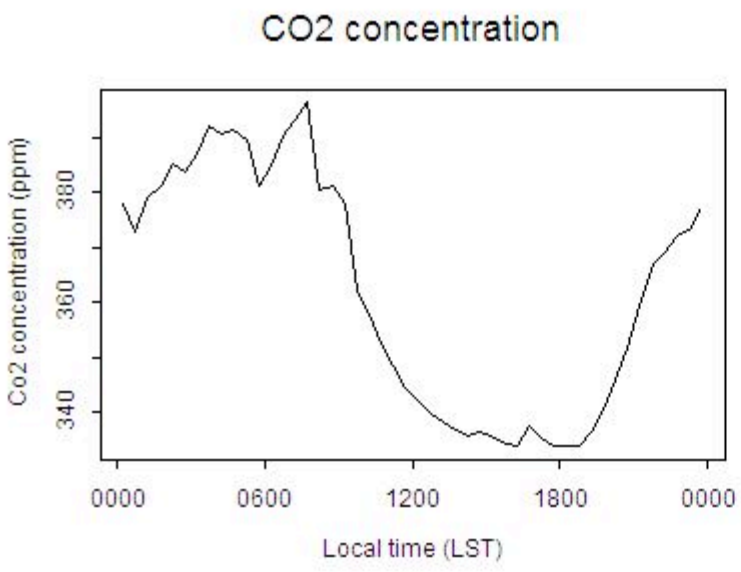
Some Results – Soy bean

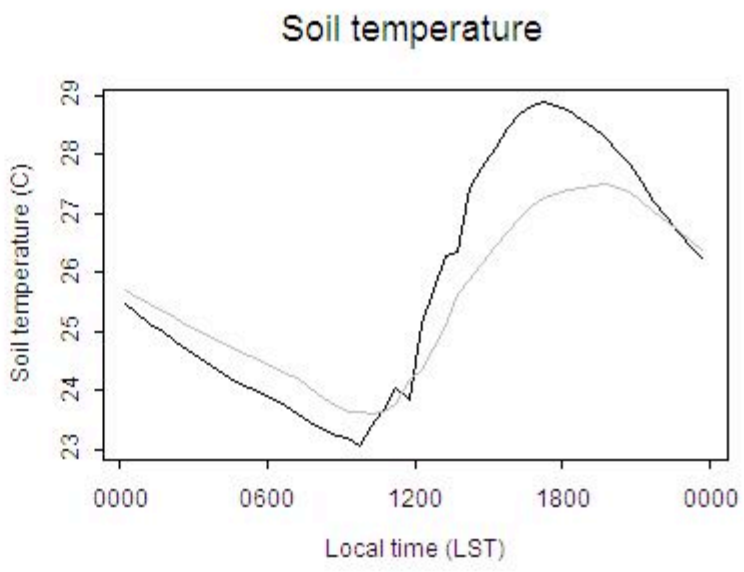
Flux observations started 8 December 2006, when the soy beans had just been planted. Flux measurements are performed by an eddy covariance system, consisting of a Campbell 3-D Sonic Anemometer and a Licor Infra-red gas analyzer. Other measurements include two levels of soil temperature and moisture.

Results

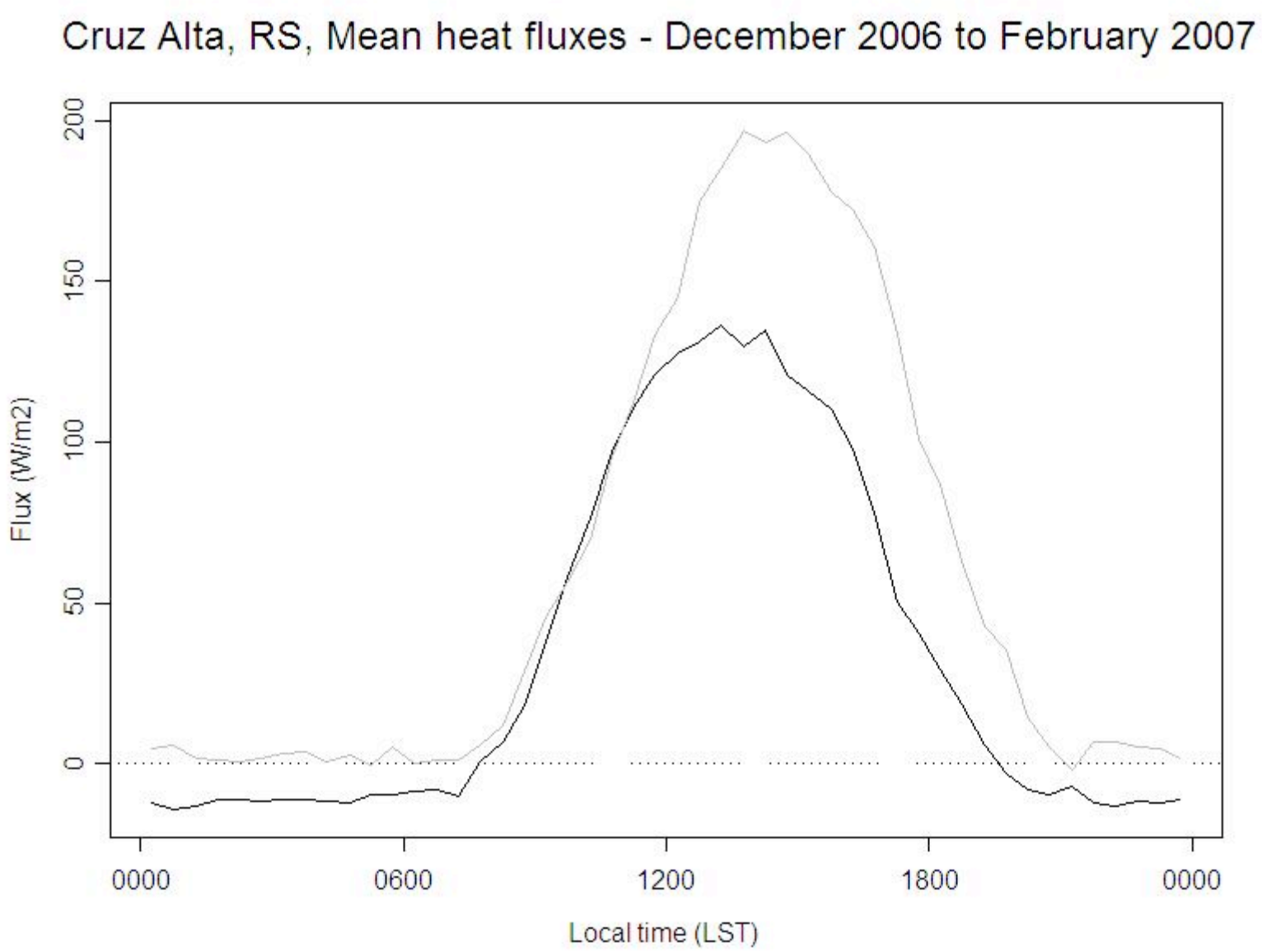

Temperature
Temperature (C)
22
24
26
28
30
32
0000
0600
1200
1800
0000
Local time (LST)


Specific humidity
Specific humidity (g/kg)
15.5
16.5
17.5
0000
0600
1200
1800
0000
Local time (LST)

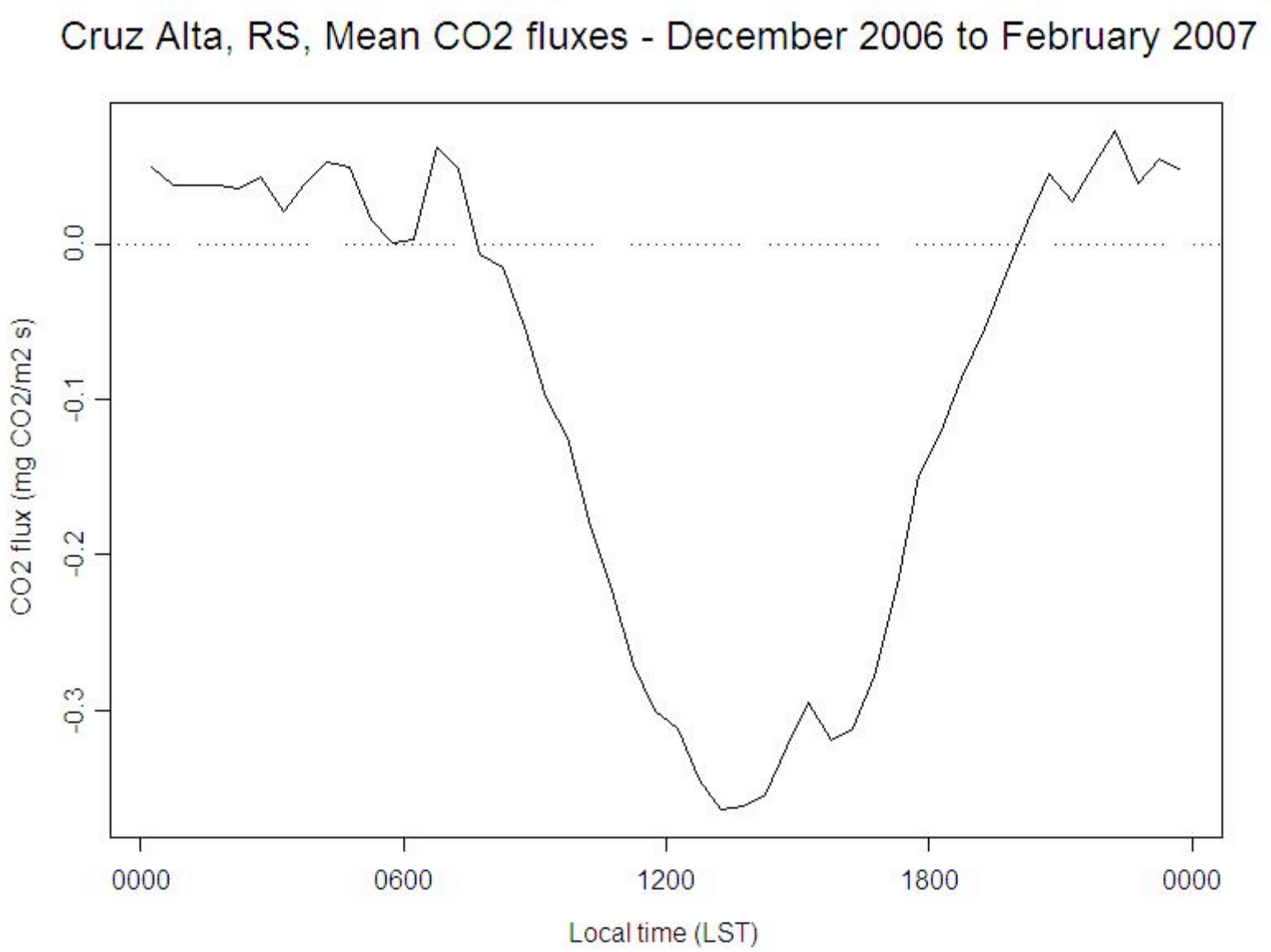

CO2 concentration
Co2 concentration (ppm)
340
360
380
0000
0600
1200
1800
0000
Local time (LST)


Soil temperature
Soil temperature (C)
23
24
25
26
27
28
29
0000
0600
1200
1800
0000
Local time (LST)

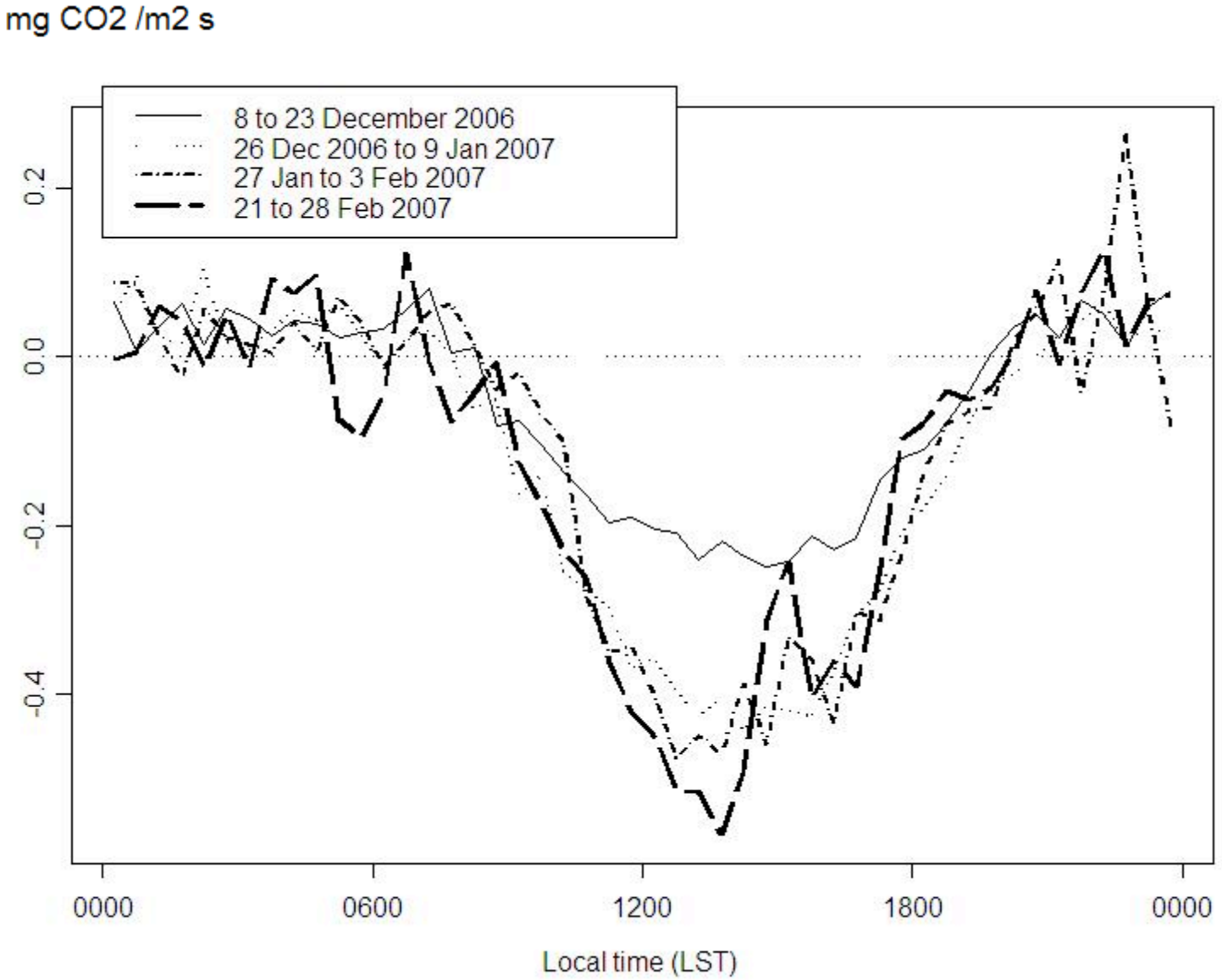
Mean daily evolution



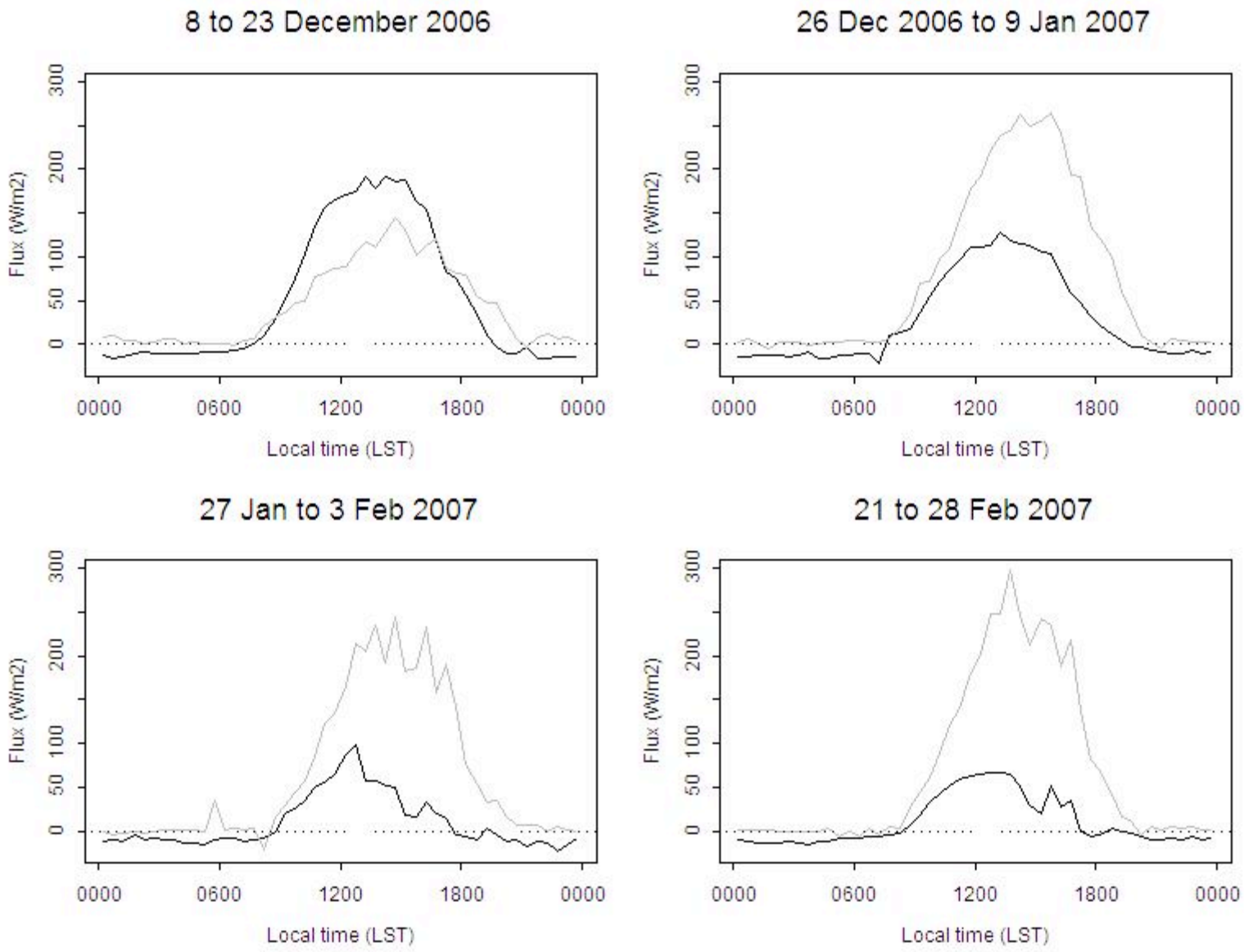
Mean daily evolution



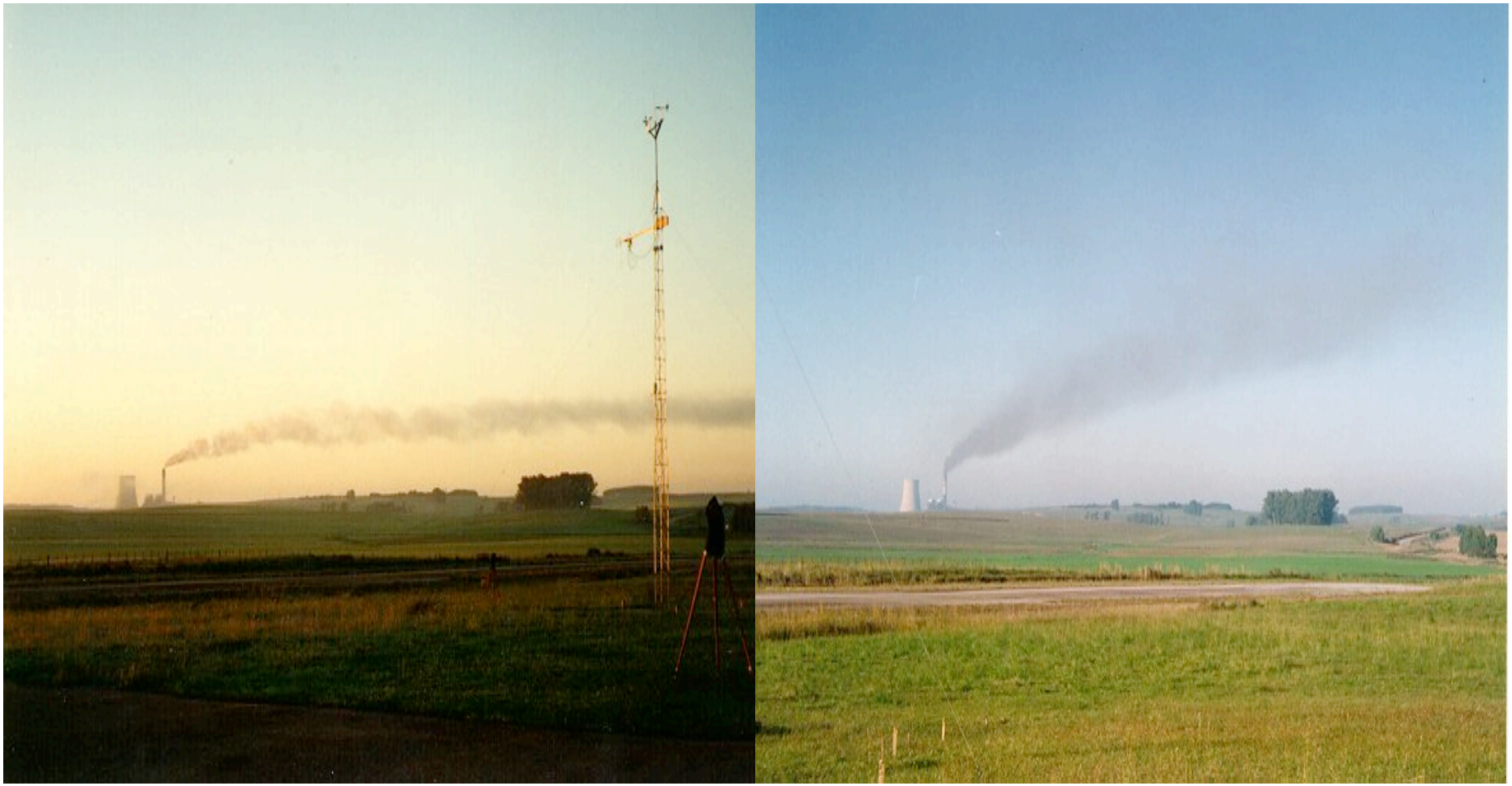
Mean daily evolution



Mean daily evolution in different periods



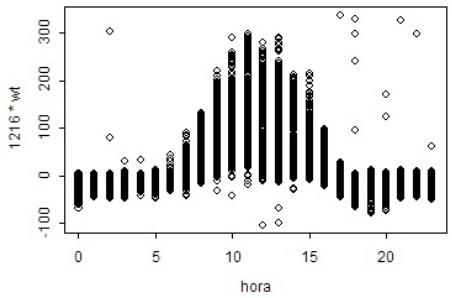
Some Results - Candiota, 1994 to 1995, restarting 2006



Experiments

- January 1994 (Pilot Exp.)
- Julho 1994 (Winter Exp.)
- Fevereiro 1995 (Summer Exp.)
- Maio 1995 (Fall Exp.)
- Novembro 1995 (Spring Exp.)
- Set. Oct 2007 (two fluxes towers)


Campinas
Guarulhos
São Paulo
Paraguay
Paraná
Asunción
Curitiba
Santa Catarina
Rio Grande do Sul
Porto Alegre
Candiota - RS, BRA
Uruguay
Rosario
Buenos Aires
Montevideo
Santiago
Argentina
Tower 1 + Met St.
Candiota - RS, BRA
Tower 2 + Met St.
Pinheiro Machado
Met St + Cont. Fluxes Meas.
Image © 2008 DigitalGlobe
Image © 2008 TerraMetrics
©2008 MapLink/Tele Atlas
Google
31°29'56.99" S 53°31'33.08" W
elev 847 ft
Eye alt 35.10 mi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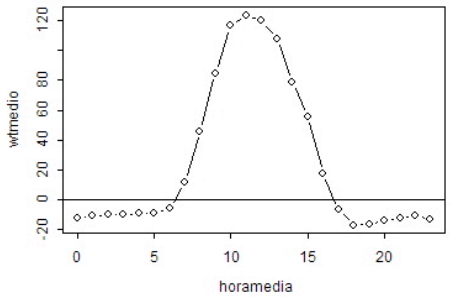
hora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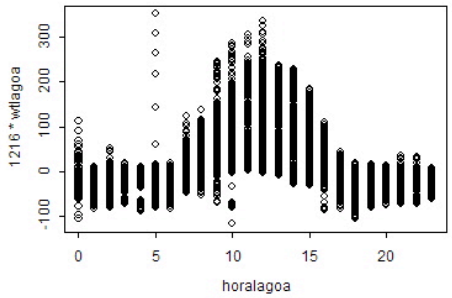
horamedia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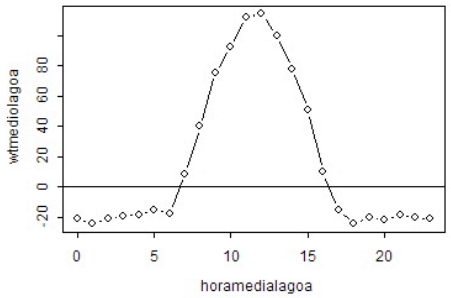
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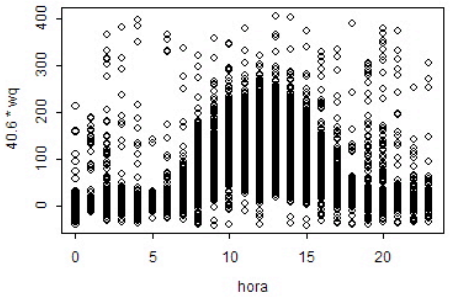
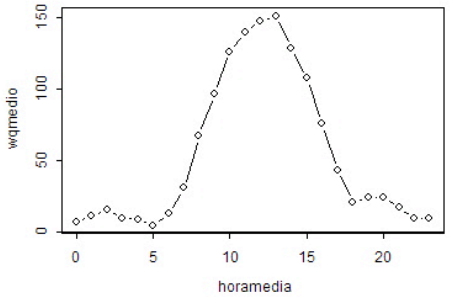

40.6 * wq
hora


wqmedio
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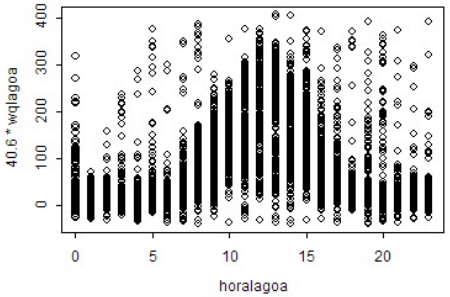
40.6 * wqlagoa
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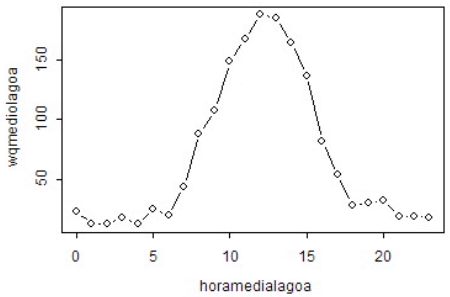
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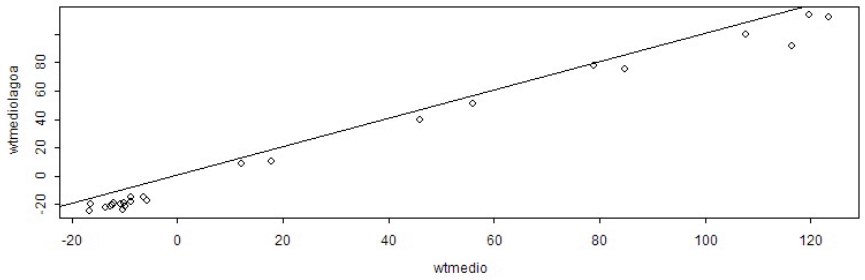
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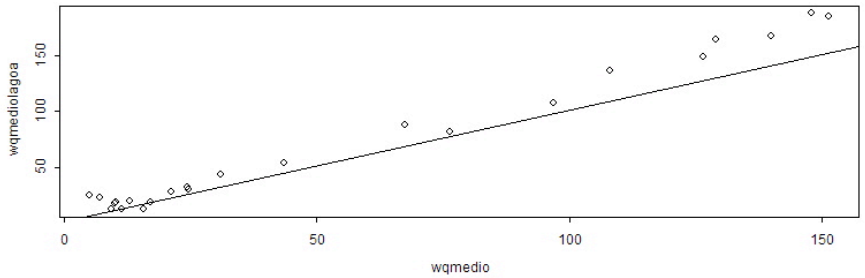
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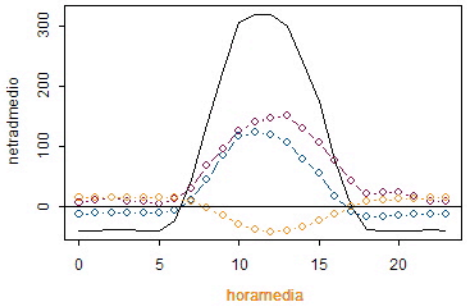
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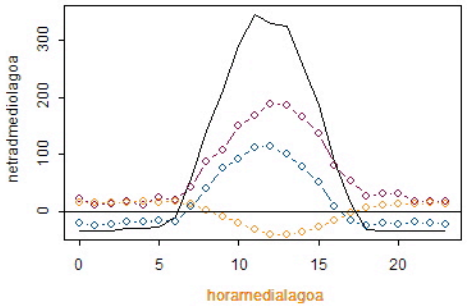
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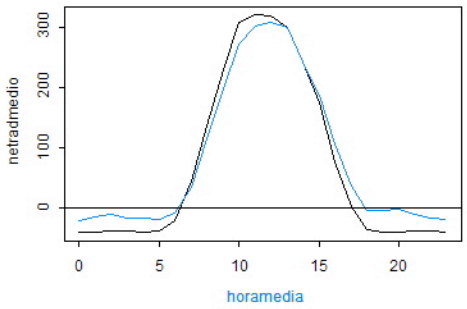
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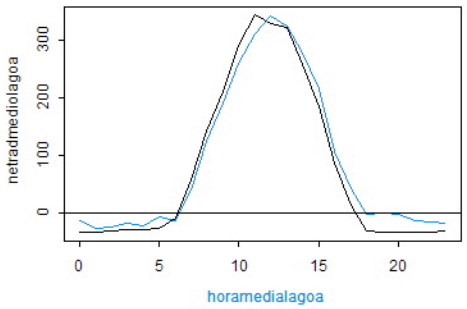
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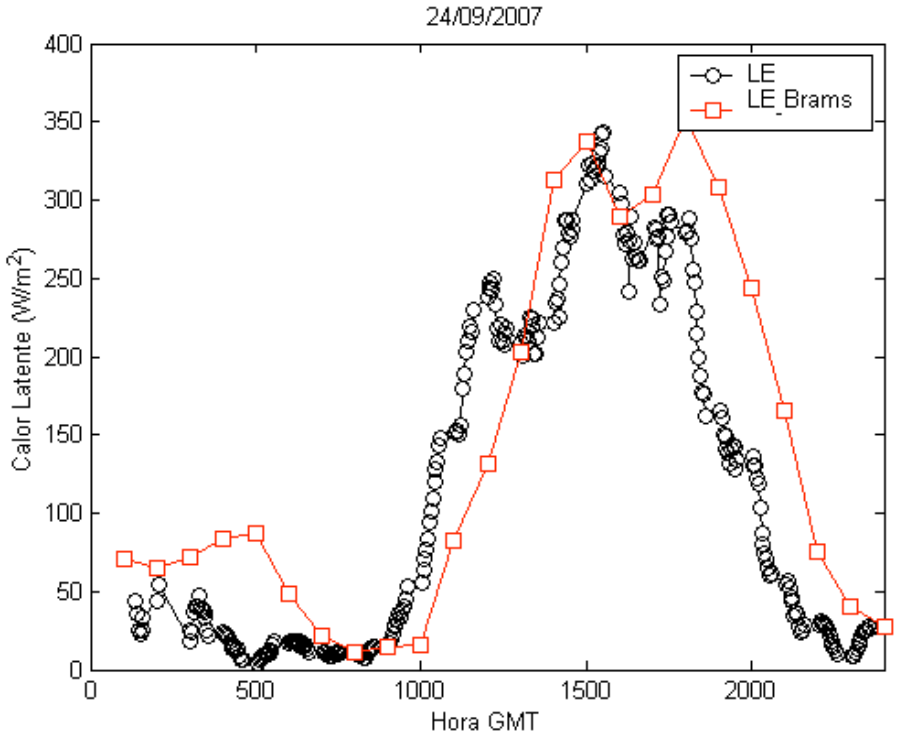
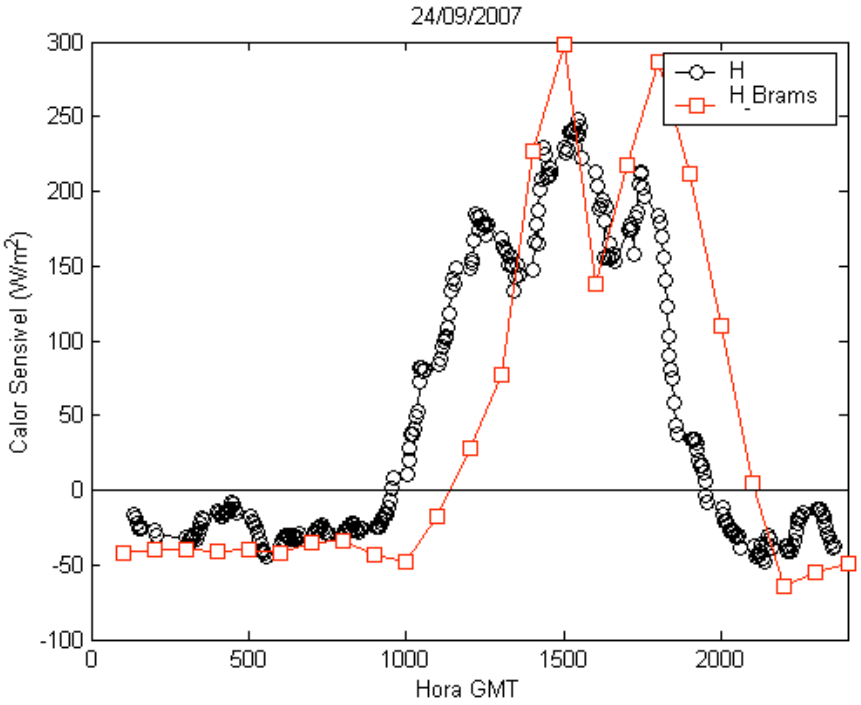
Aditional and related Studies

- Modeling – Evaluation of PBL schemes in RAMS
- Model Calibration – SIB2 (SALDAS: South American Land Data Assimilation System – L. G. Gonçalves NASA GSCF)
- Modeling – The role of the PBL schemes in numerical simulations of MCS (ongoing).

Preliminary Results

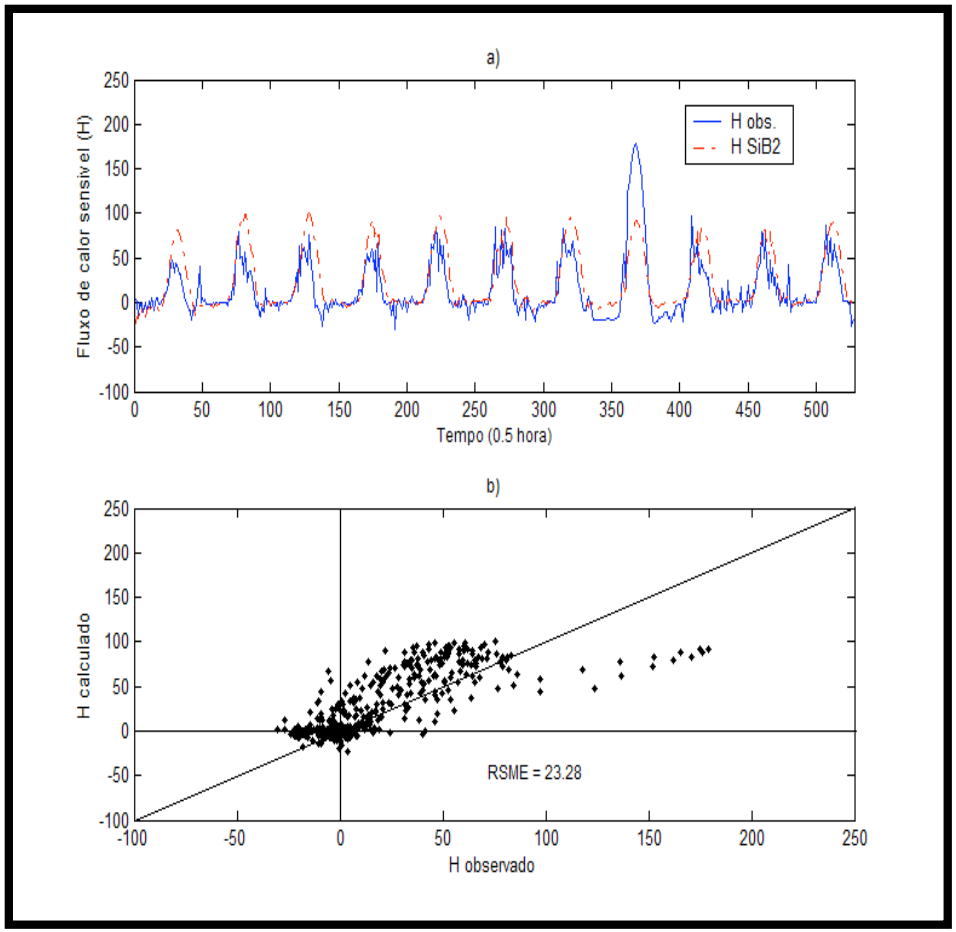
- K's model (JAM, 40, 2001) – Valid under fair-weather conditions only.



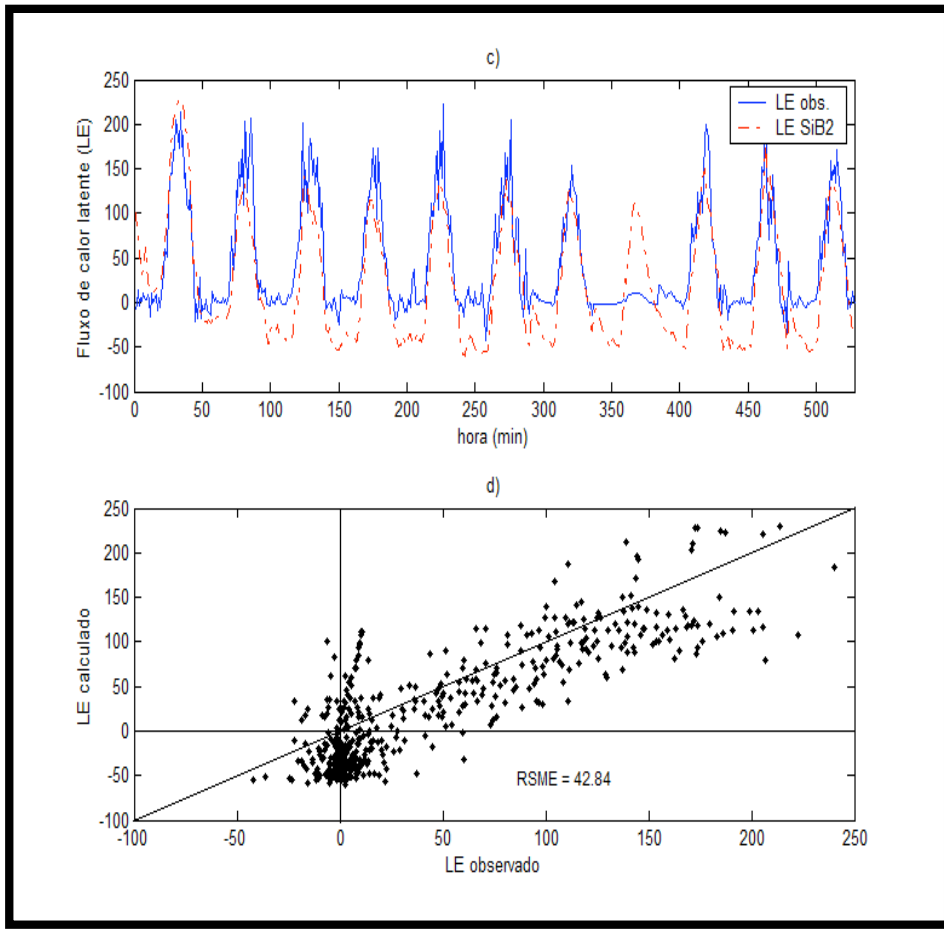


Preliminary results – SIB2 calibration using data from Paraiso (rice)

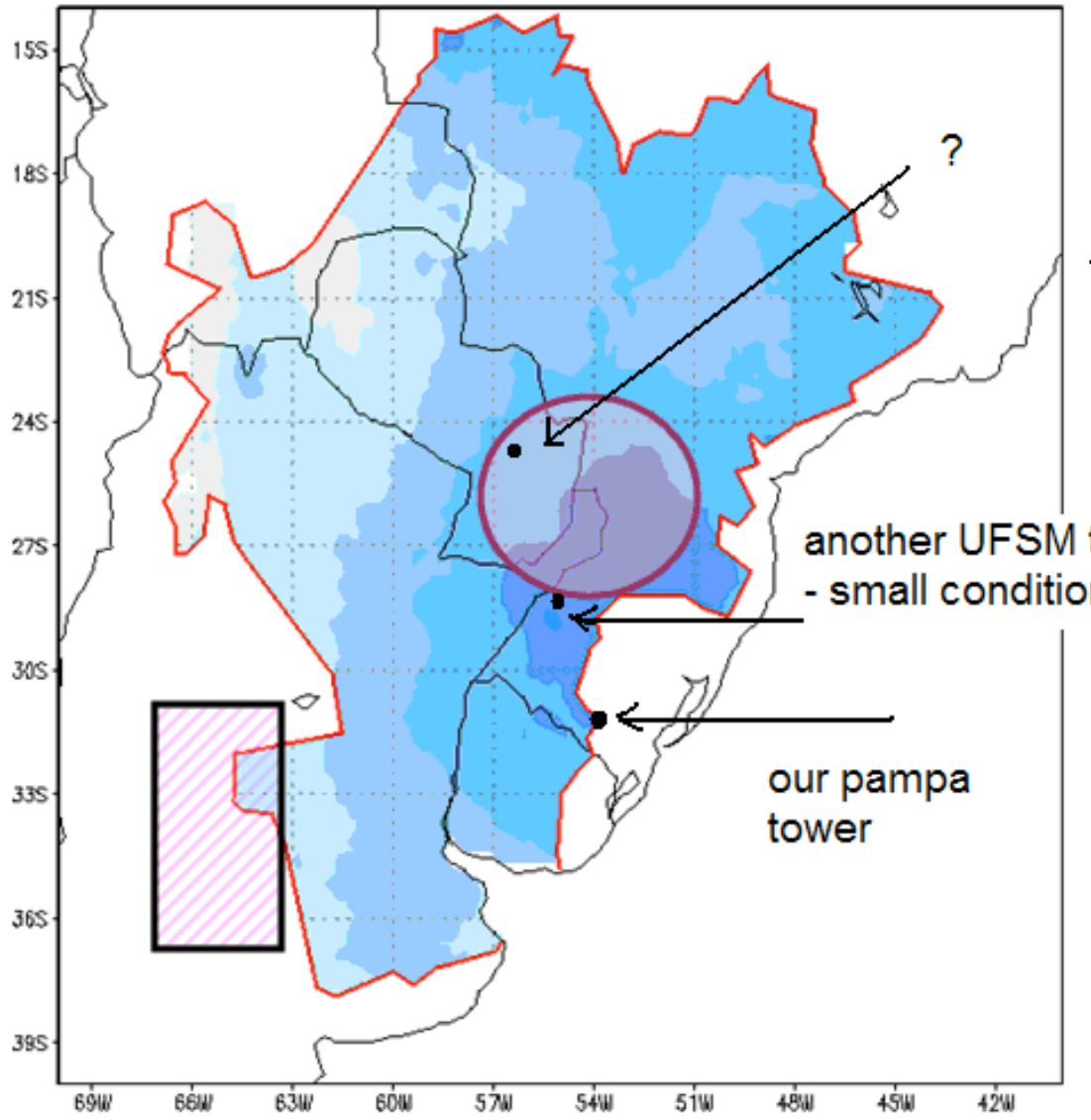
Sensible heat flux



Latente heat flux



Proposal for LPB fluxes towers



UFSM's towers can be used for long term observations