



# La Plata Basin (LPB) Regional Hydroclimate Project



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## *LPB issues:*

- Extreme events: Floods and Droughts
- Monitoring and Prediction
- Climate change: ACC, land use change, biomass burning

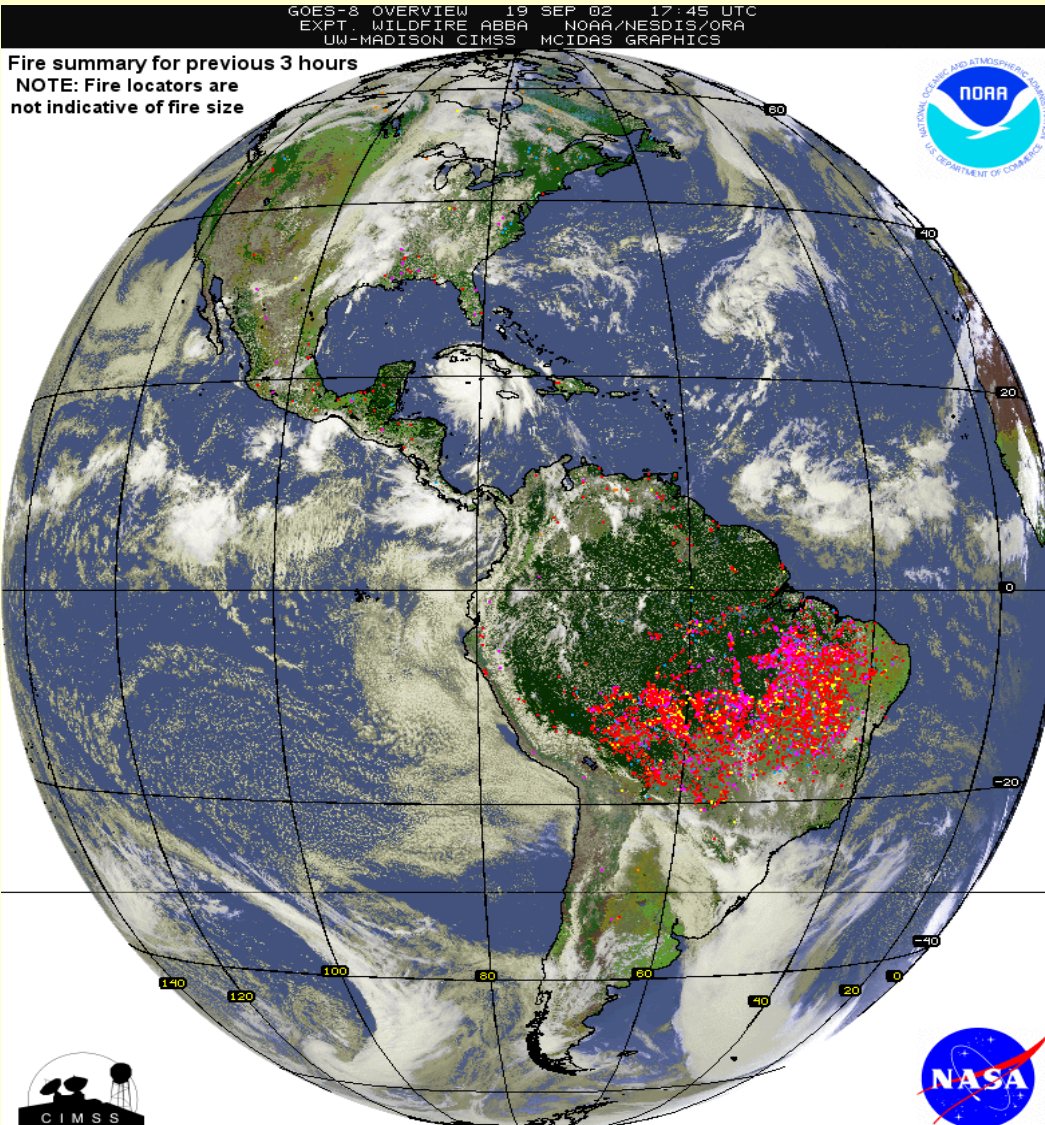
# Issues to be discussed

- Biomass burning
- LPB-3 meeting at Itaipu (BR/PY)
- Monitoring and prediction
- LPB-US scientists meeting



# GOES-8 ABBA FIRE PRODUCT

1745Z 19 SEP 2002

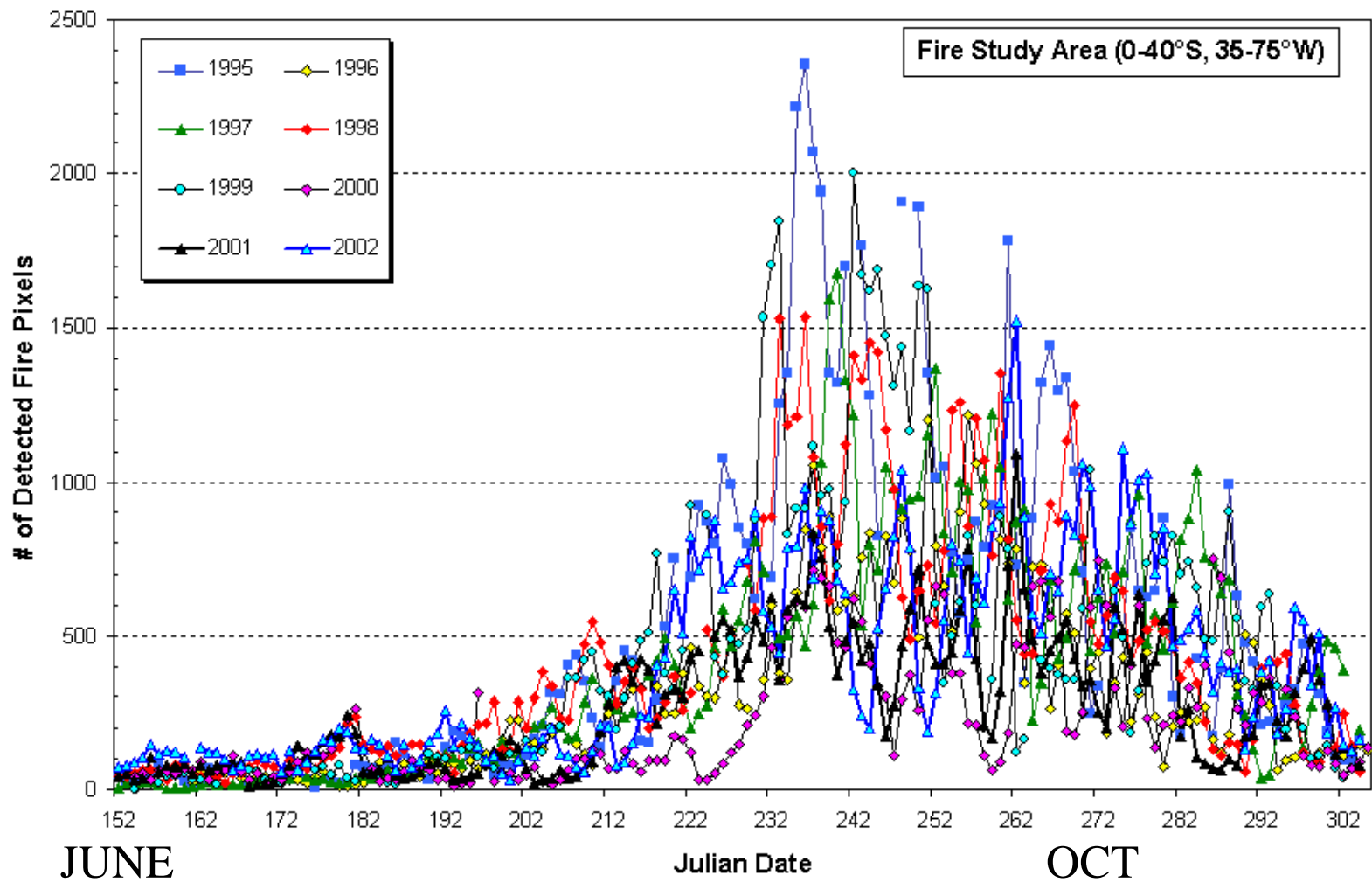


- How do aerosols contribute to cloud processes?
- What is the impact of advected aerosol on the surface heat and moisture budgets?
- What is the radiative effect in the precipitation processes?

GOES-8 ABBA Detected Fire Pixels at 2045 UTC  
Comparisons of the Fire Seasons in South America 1995-2002

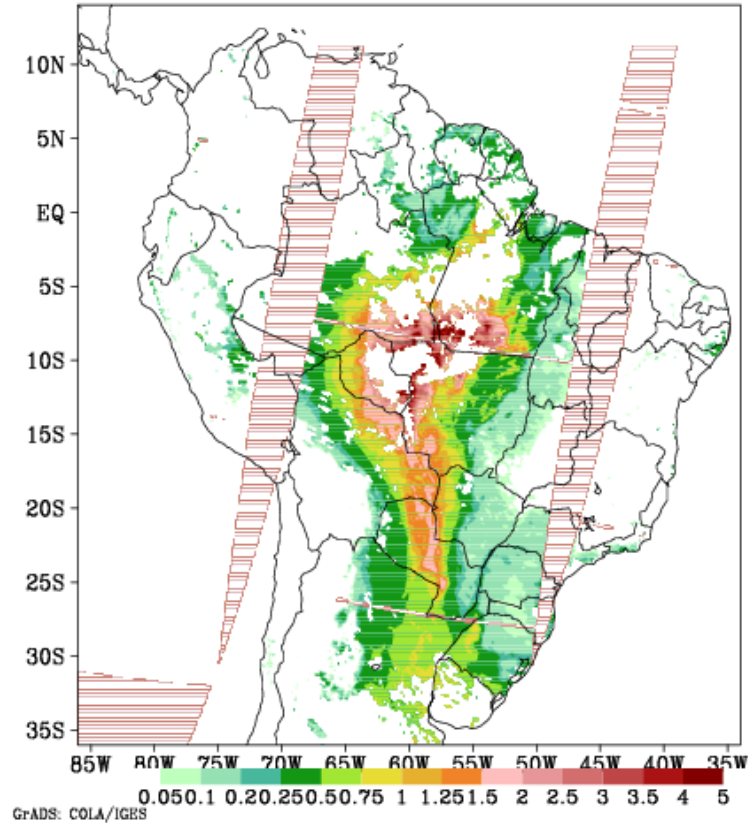
UW-Madison/SSEC/CIMSS

NOAA/NESDIS/ORAJ/SPT

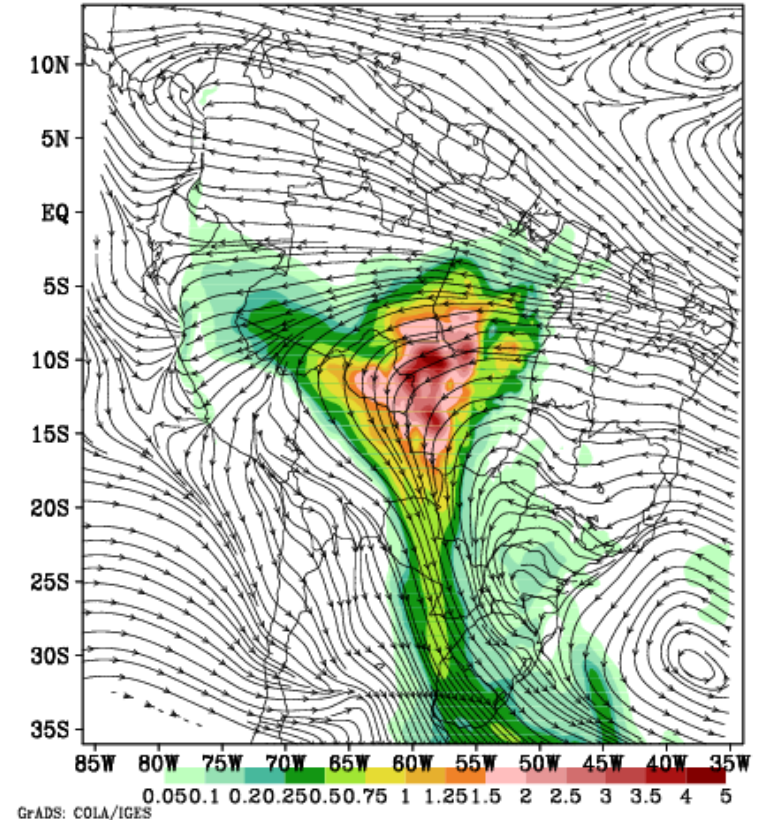


# Aerosol effects

MODIS AOT (470 nm)

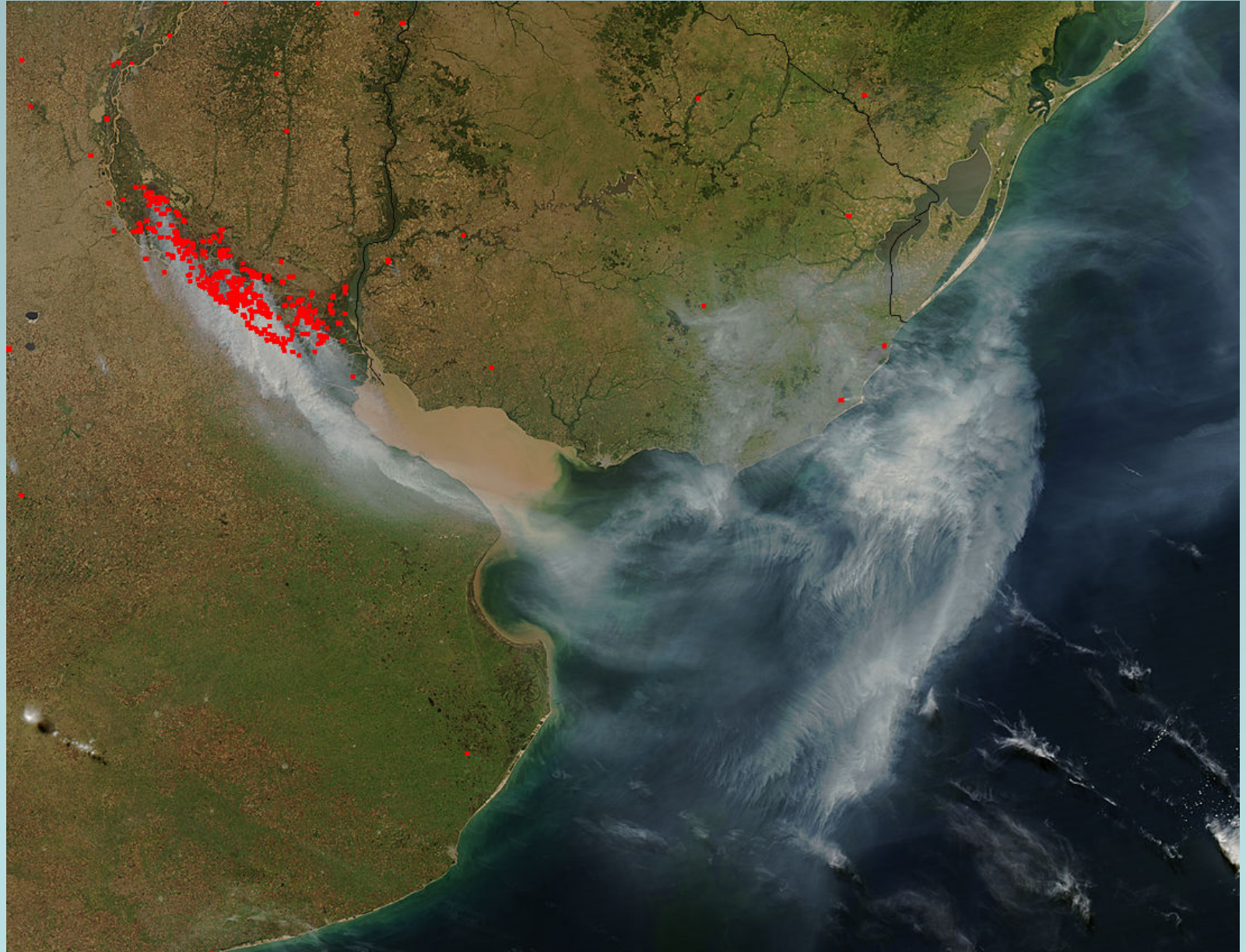


Model AOT (470 nm)



Numerical simulation and validation with MODIS of aerosol optical thickness.  
Freitas et al (2005)

# “Buenos Aires” April 2008



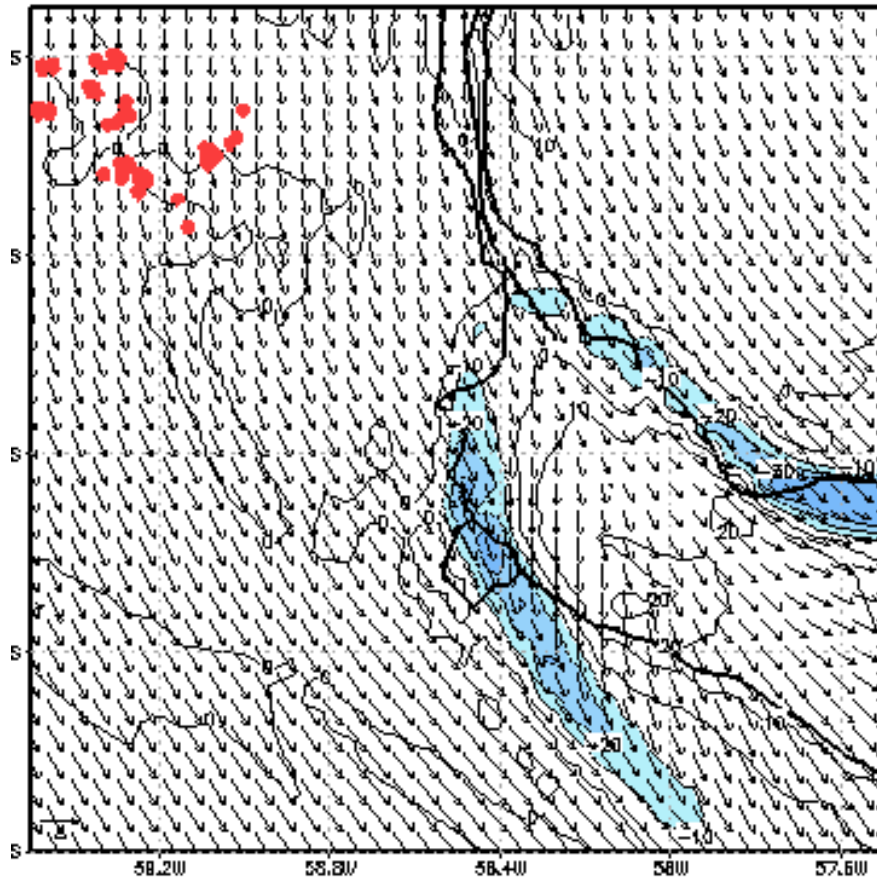
# Buenos Aires?



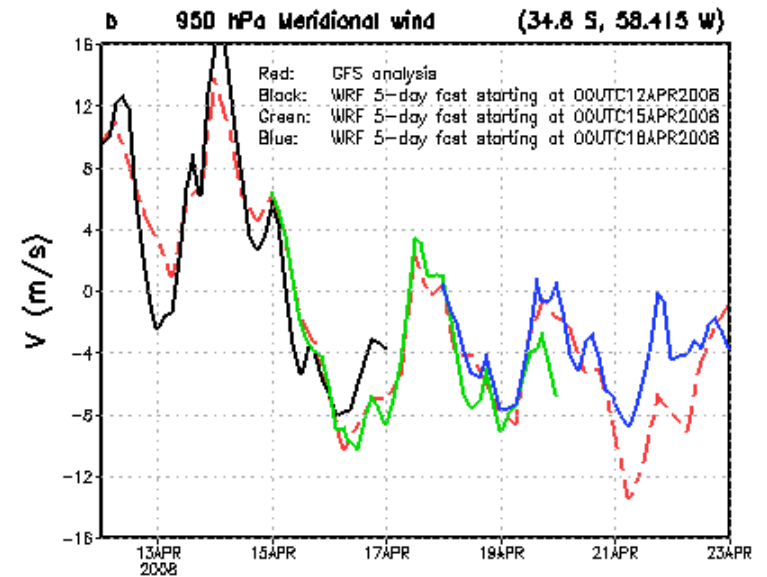
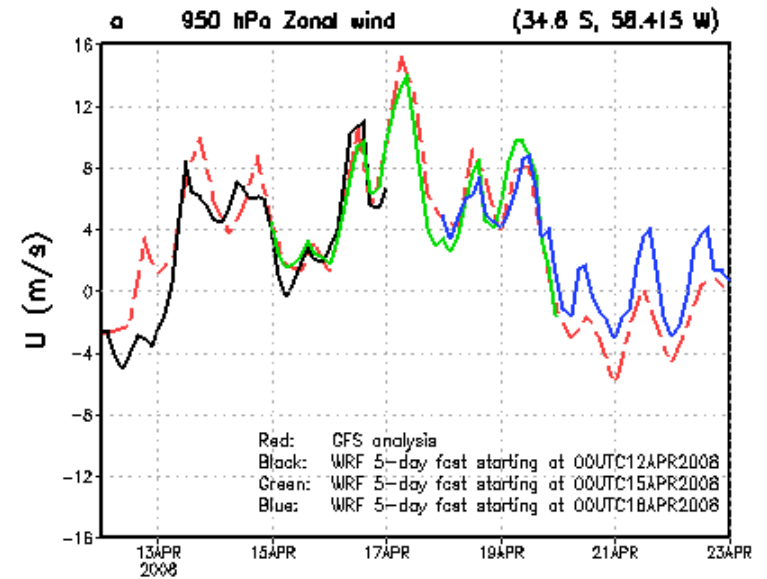
# WRF model forecasts at 4 km

## Influence of a river-land circulation

b Wind at 10 m and its convergence 15:00 LT



## Predictability of the event





# Itaipu hydropower plant

(LPB-3)



LPB-3  
Itaipu Hydropower Plant  
Feb 2008

Field Campaign Planning



***WG-1: Data collection and data recovery***

***WG-2: Radar, satellite and lightning measurements***

***WG-3: Radiation, aerosols, and trace gases***

***WG-4: Flux Towers and soil moisture measurements***

## LPB-3

### LPB/WCRP-Itaipu Framework Agreement *(being drafted)*

*Itaipu → LPB: allow the use of their secured areas to install instruments; use of their facilities for workshops and conferences; train students (and provide support!)*

*LPB → Itaipu: LPB will provide forecasts and other products for the sub-basins of interest (through CPTEC and others)*

# Monitoring of seasonal conditions

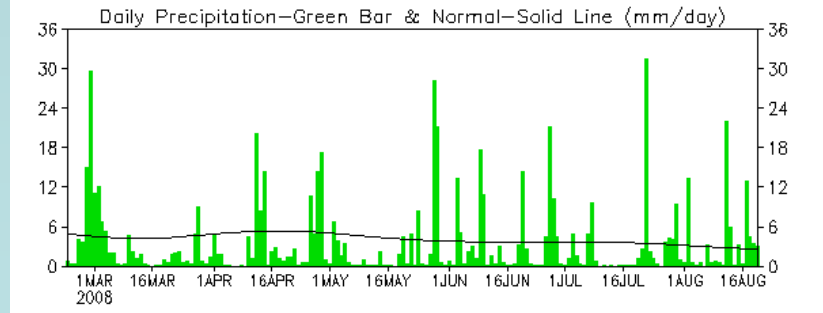
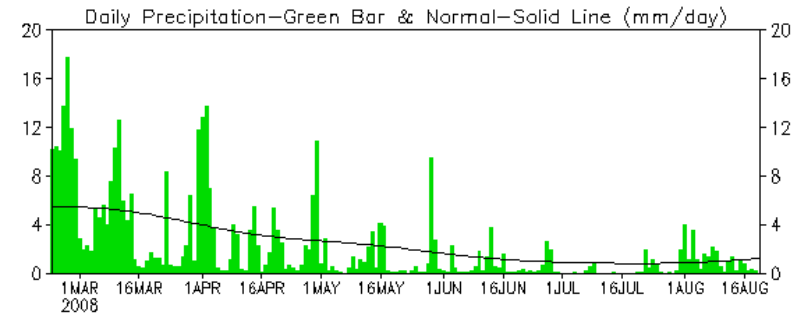
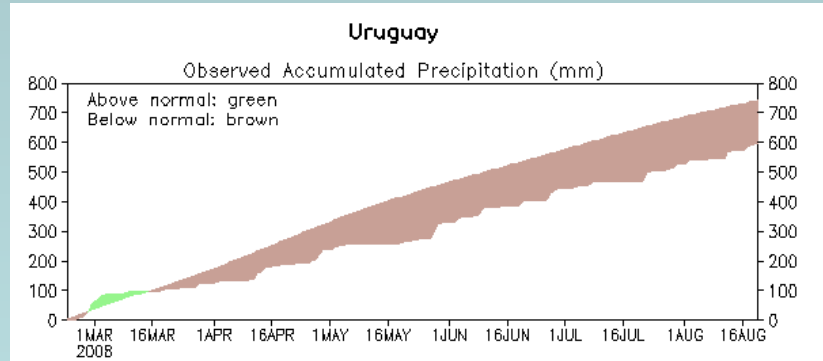
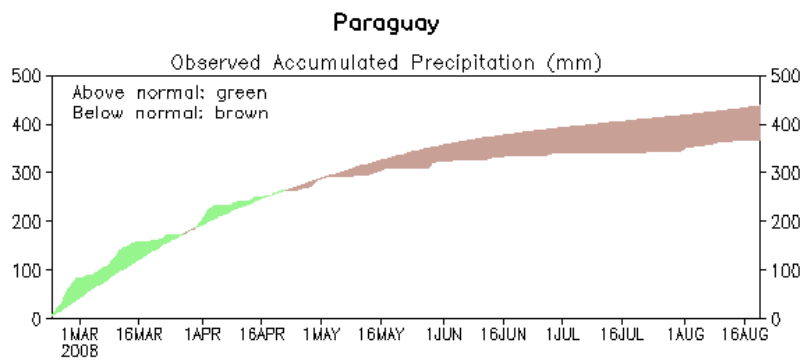
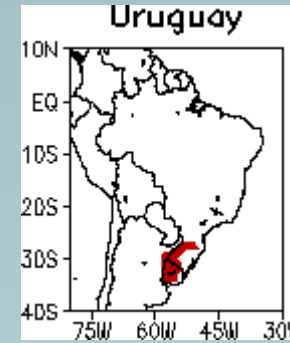
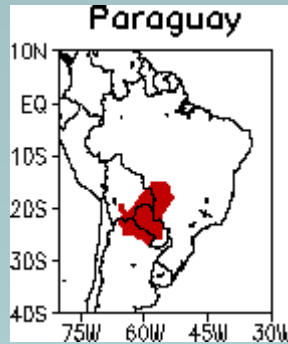
Activities being carried out at operational centers

**CPC - CPTEC - SMN(AR) - MASTER (USP)**

*Soon to be added: IRI*

*(An LPB-IRI cooperation agreement has been signed)*

# Example 1: Basin averages. 180-day accumulated P (% of normal) 1MAR08 – 16AUG08



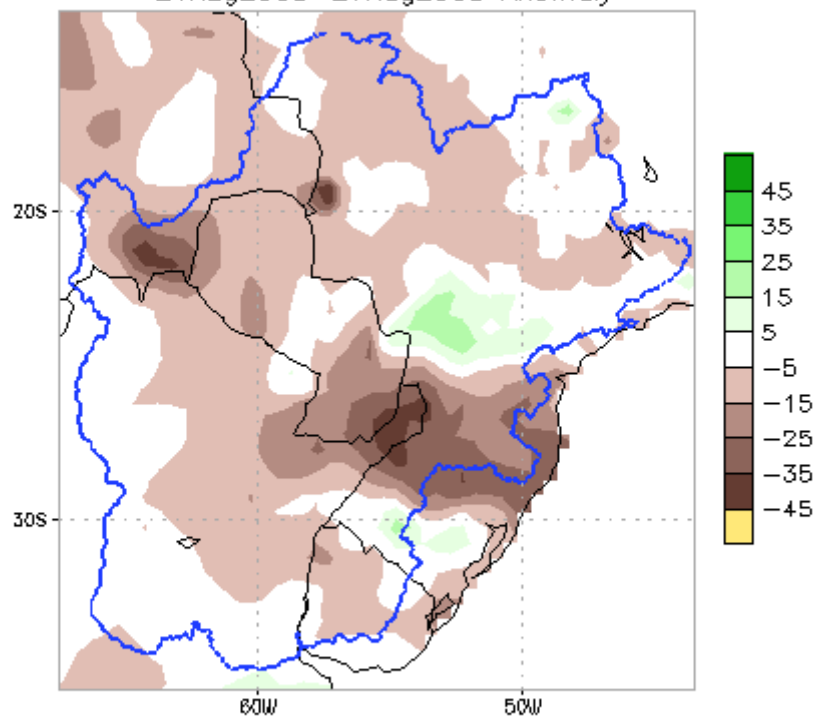
Data Source: CPC (Gauge-Based) Unified Precipitation (Climatology 79–95)  
(updated on 00Z20AUG2008)

Data Source: CPC (Gauge-Based) Unified Precipitation (Climatology 79–95)  
(updated on 00Z20AUG2008)

# Example 1': GFS ensemble forecasts Accumulated P (% of normal)

## Week 1

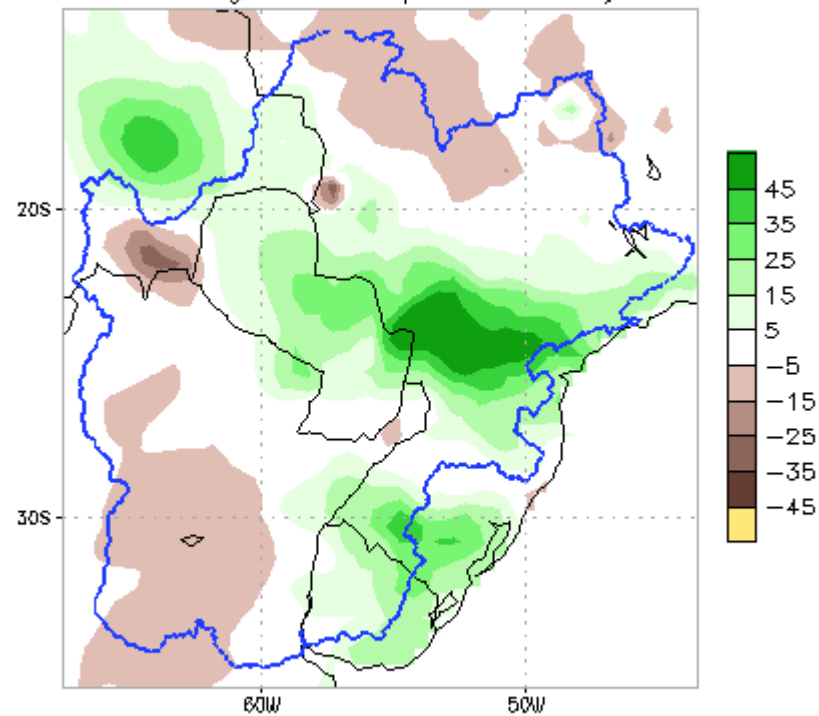
NCEP GFS Ensemble Forecast 1-7 Day Precipitation (mm)  
from: 21Aug2008 for La\_Plata\_Basin  
21Aug2008-27Aug2008 Anomaly



Bias correction based on last 30-day forecast error  
CPC Unified Precip Climatology (1979-1995)

## Week 2

NCEP GFS Ensemble Forecast 8-14 Day Precipitation (mm)  
from: 21Aug2008 for La\_Plata\_Basin  
28Aug2008-03Sep2008 Anomaly




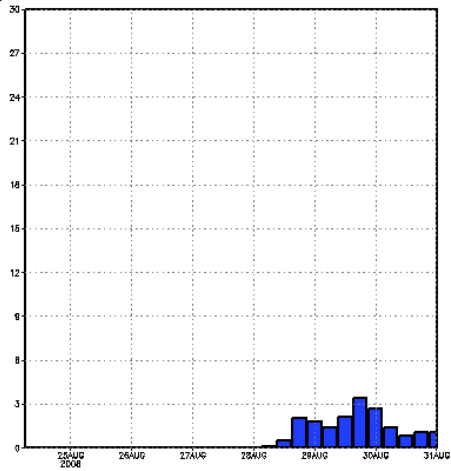
Bias correction based on last 30-day forecast error  
CPC Unified Precip Climatology (1979-1995)

# Example 2: Products at CPTEC/INPE




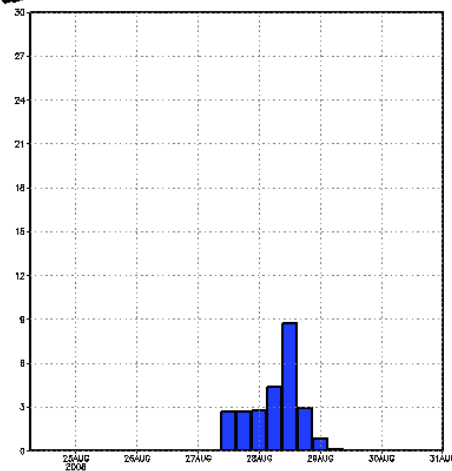
## Basin forecasts

 **ETA Model – Paraná Upper Basin**  
Inicial condition – 00Z of 24/08/2008  
Accumulated Average Precipitation of 6 hours (mm)




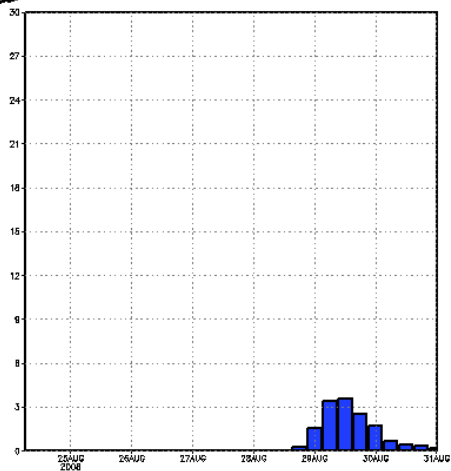
CPTEC/INPE

 **ETA Model – Paraná Lower Basin**  
Inicial condition – 00Z of 24/08/2008  
Accumulated Average Precipitation of 6 hours (mm)




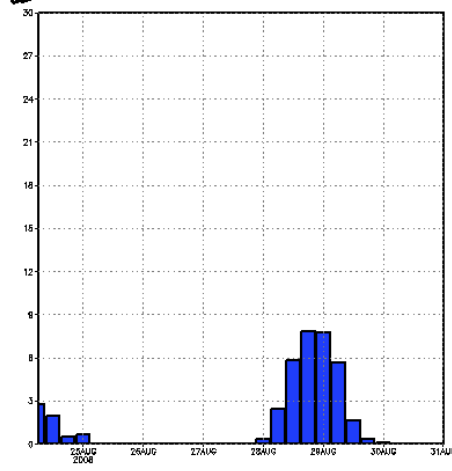
CPTEC/INPE

 **ETA Model – Paraguay Basin**  
Inicial condition – 00Z of 24/08/2008  
Accumulated Average Precipitation of 6 hours (mm)



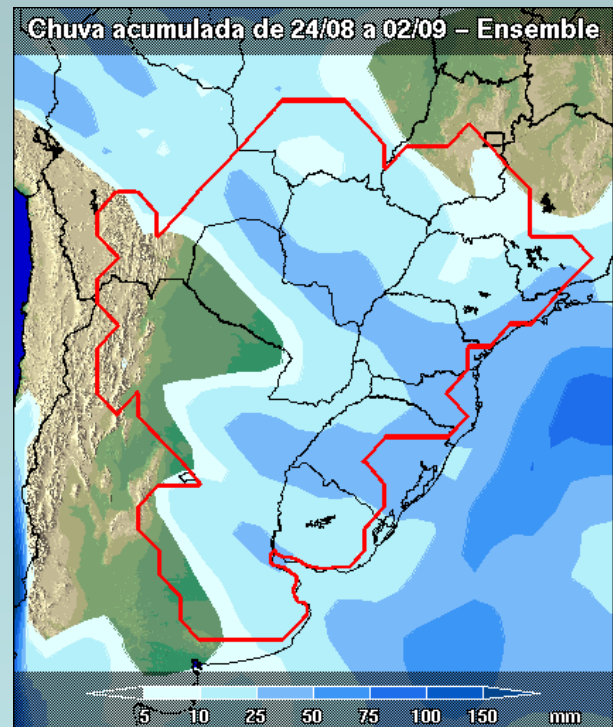
CPTEC/INPE

 **ETA Model – Uruguay Basin**  
Inicial condition – 00Z of 24/08/2008  
Accumulated Average Precipitation of 6 hours (mm)

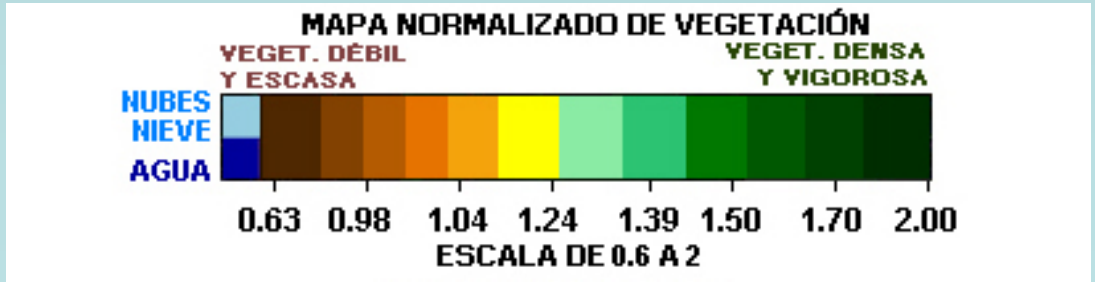
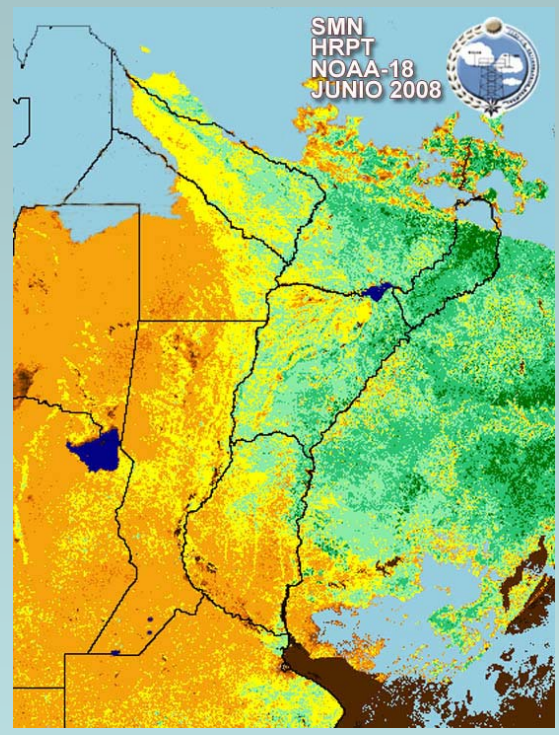
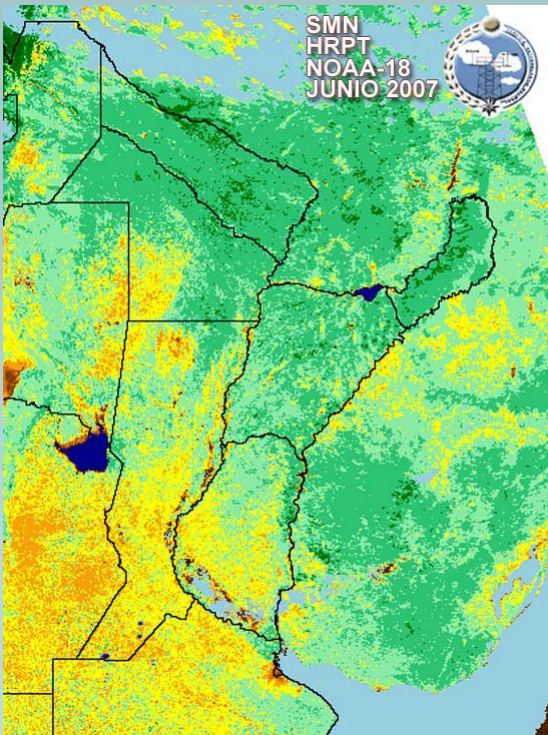
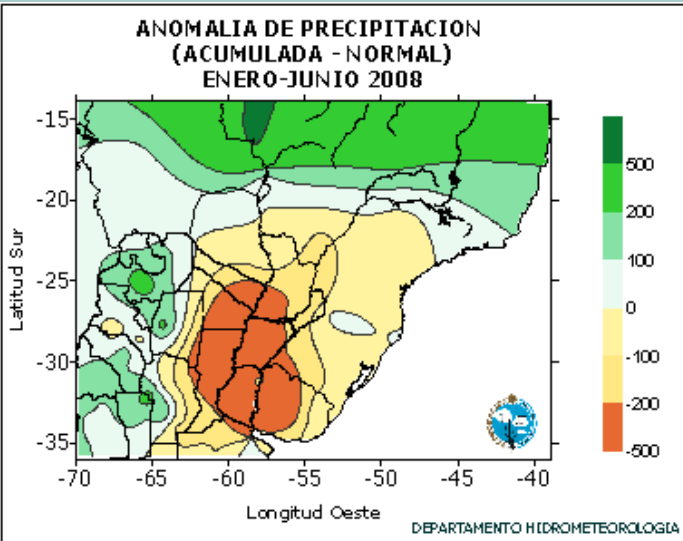


CPTEC/INPE

## Ensemble Forecasts

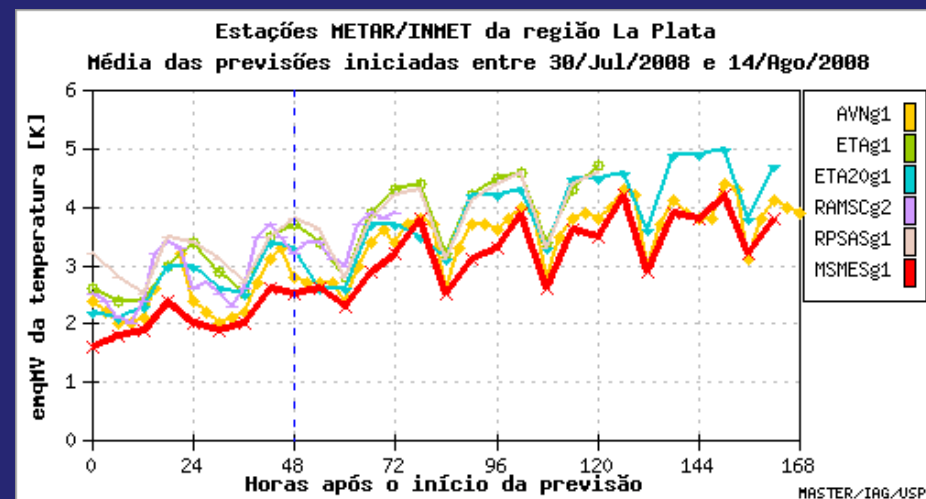
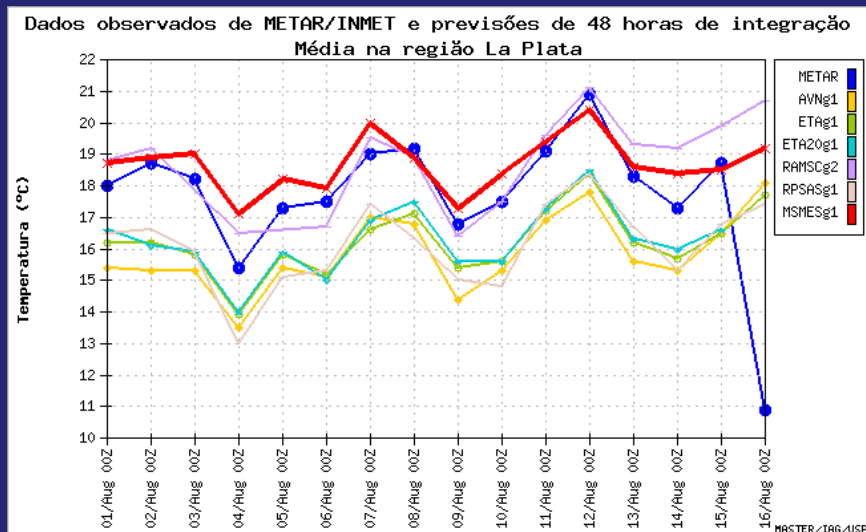
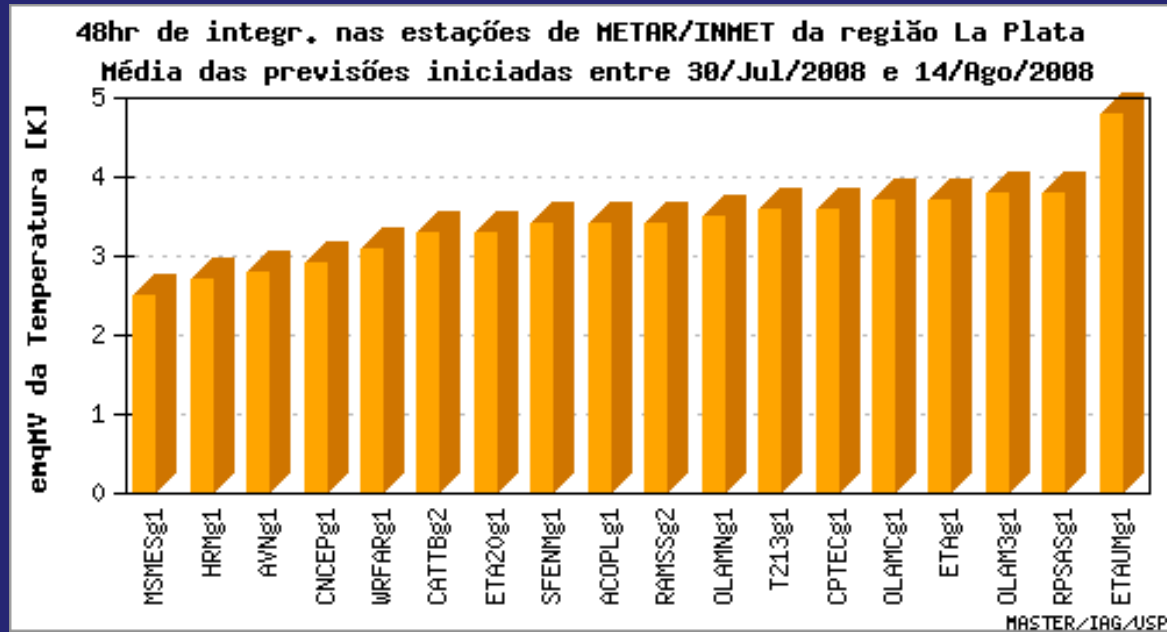
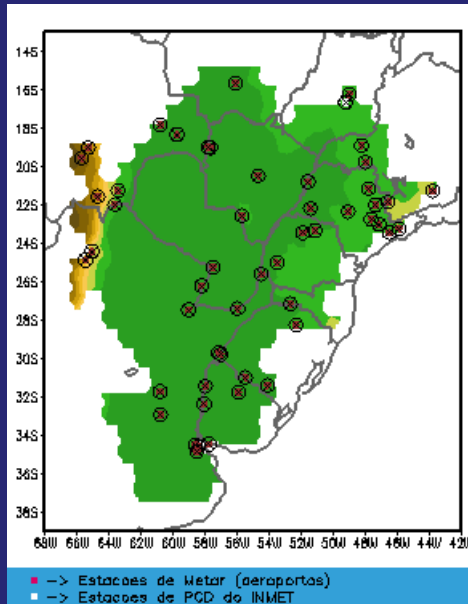


# Example 3: Products at SMN(AR)





# MASTER - Univ of Sao Paulo





## *Education and outreach*

With IAI support, a capacity building course aimed at graduate students and young scientists will take place during 2009.

The course will present:

- *Land surface interactions with the atmosphere,*
- *Assimilation of surface data (specifically related to surface processes),*
- *The regional climatic controls that impact the hydroclimate of the La Plata Basin.*

### **Tentative syllabus:**

1. Data assimilation systems
2. Regional land data assimilation systems
3. Remote sensing
4. Satellite products and their input in data assimilation systems
5. Ecosystems, land cover/land use
6. Regional modeling
7. Land-atmosphere interactions and feedbacks
8. The hydroclimate of the La Plata basin
9. Hydrological modeling

An LPB-US scientists meeting took place on  
24-25 April 2008 in Boulder, Colorado

**EOL/UCAR Facilities**  
**Field experiment only**

**ISFF: Flux Towers/Soil Moisture**

**SPOL: Radar**

*[one option is to propose upgrades to local radars, as was done during NAME]*

**ISS: Radiosondes/Profiler**

**RAF: Aircraft (Soil moisture? Aerosols?)**

**Lidar**

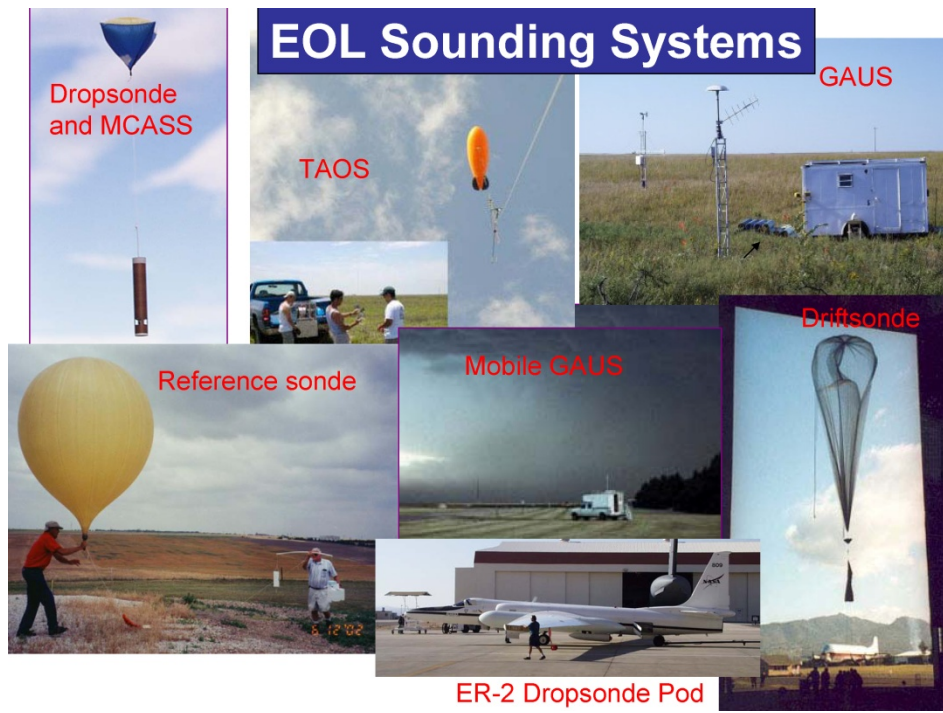
# NCAR S-pol radar



10 cm Doppler, polarimetric radar  
 Highly portable, six 20 ft. seatainers  
 Diesel generator powered  
 Easy set up  
 Peak power 1 Mw  
 1 degree beamwidth antenna  
 Suite of Doppler and polarimetric variables  
 Doppler measurements, polarimetric-based rainfall maps, hydrometeor identification  
 Internet ready  
 Requested via NCAR/NSF and deployments funded by Deployment Pool.  
 Well suited to international deployments.



## EOL Sounding Systems



### Raman-shifted Eye-safe Aerosol Lidar (REAL)



NCAR's Raman-shifted Eye-safe Aerosol Lidar (REAL), developed by ATD scientists, is one of the few lidars that can be used in highly populated areas. The eye-safe and scanning capability expands the lidar's applications to include mapping urban atmospheric pollutants, and studies of dispersion very near the surface of the earth.

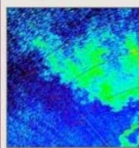
[Why is REAL Unique?](#) | [References](#) | [Staff](#)

#### Why is REAL Unique?

[Wavelength and Pulse Energy](#) | [Backscatter Depolarization](#) | [Direct Analog Detection Applications](#) | [History](#) | [The Technical Challenge](#)

**Wavelength and Pulse Energy:** REAL's wavelength (1.54 microns) lies within a band that is the safest in the entire optical spectrum. Photons in the 1.5-1.8 micron band are safely absorbed over several millimeters of depth in the eye humor. At shorter wavelengths photons can reach the retina causing damage and longer wavelengths are absorbed in near the eye's surface causing damage to the cornea. The American National Standard for Safe Use of Lasers reports that this wavelength band is the highest allowable eye-safe region. Therefore, by operating at this wavelength, REAL can safely transmit very high energy laser pulses that generate strong aerosol backscatter.

#### Lidar Links



See animations of REAL scans

[Scans from Boulder >>](#)

#### REAL News

[Highlights from T-REX >>](#)

## 915-MHz Profilers

- Atmospheric Research
  - Profilers purchased or developed by university or federal government research groups
  - Profiler technology not as complicated as high frequency scanning radars
- Universities with 915 MHz profilers include:
  - NCAR (three ISSs & one MAPR)
  - U. Alabama at Huntsville
  - McGill University
  - U. North Dakota
  - CU Boulder
- Federal Labs with 915 MHz profilers include:
  - NOAA ESRL
  - DOE ARM
  - Argonne National Lab



# *Thanks...*

## Useful URLs

-<http://www.eol.ucar.edu/projects/lpb>

-<http://www.cptec.inpe.br/lpb>

-<http://www.smn.gov.ar>



# LPB Funding – (update Mar '08)



## Many Regional Projects

- Mesonet, Flux Towers in San Luis, AR
- Flux Tower in Cruz Alta, BR;
- Several other projects (including regional collaborations) > \$2.5 M

## CLARIS - LPB

A Europe-South America Network for Climate Change Assessment and Impact Studies - €~3.3M

## NASA

Remote Sensing/Data assimilation - Capacity Building

## IAI

Ecosystems, Biodiversity, Land Use and Cover, and Water Resources

## CIC-GEF

Framework Program for the sustainable management of the La Plata Basin water resources, in relation to climate variability and change \$ 10.7 M (~0.9 M)

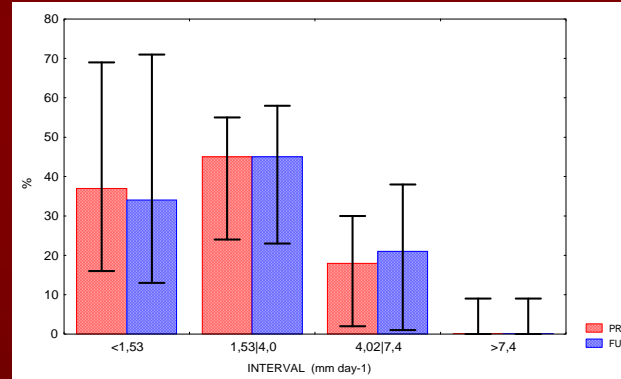
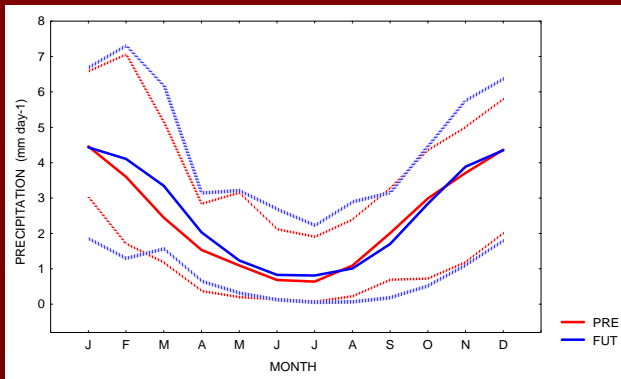
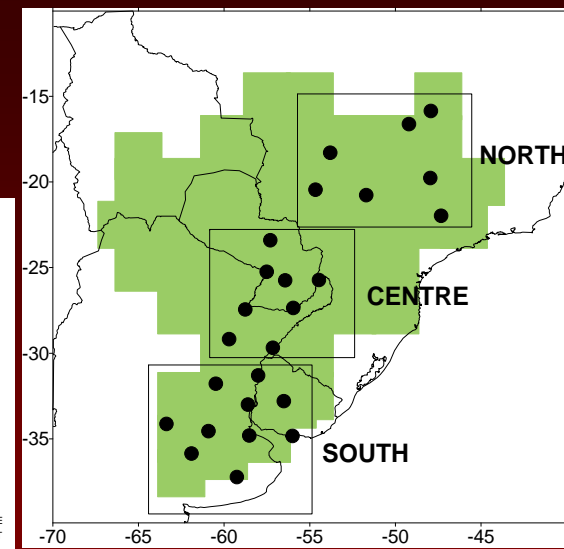
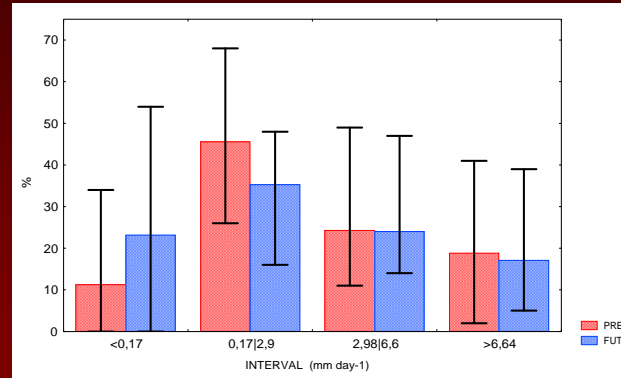
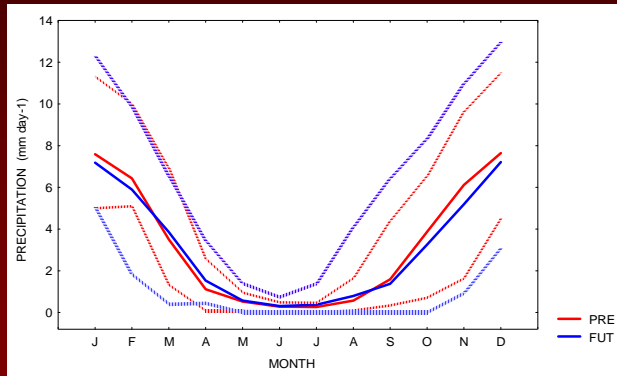
## NCAR (NSF)

Collaborations during Field Experiment

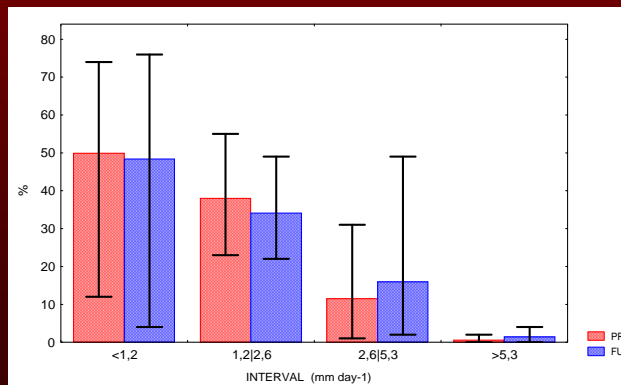
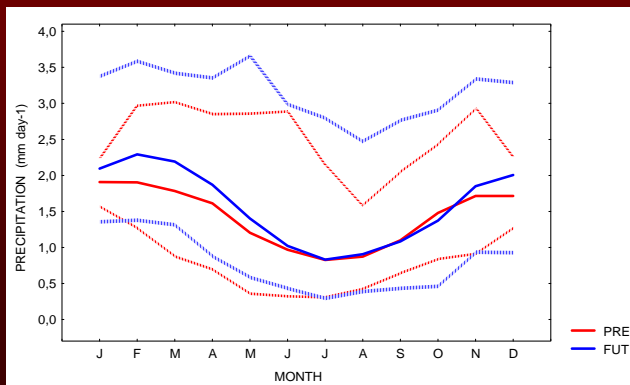
## ARM (DOE)

Collaborations during Field Experiment

# Present and future ENSEM precipitation and inter-model dispersion (courtesy C. Vera)



Left panels: annual cycles (present in red and future in blue)



Right panels: histograms of distribution (present in red and future in blue).