



La Plata Basin (LPB) Regional Hydroclimate Project



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

Main science questions:

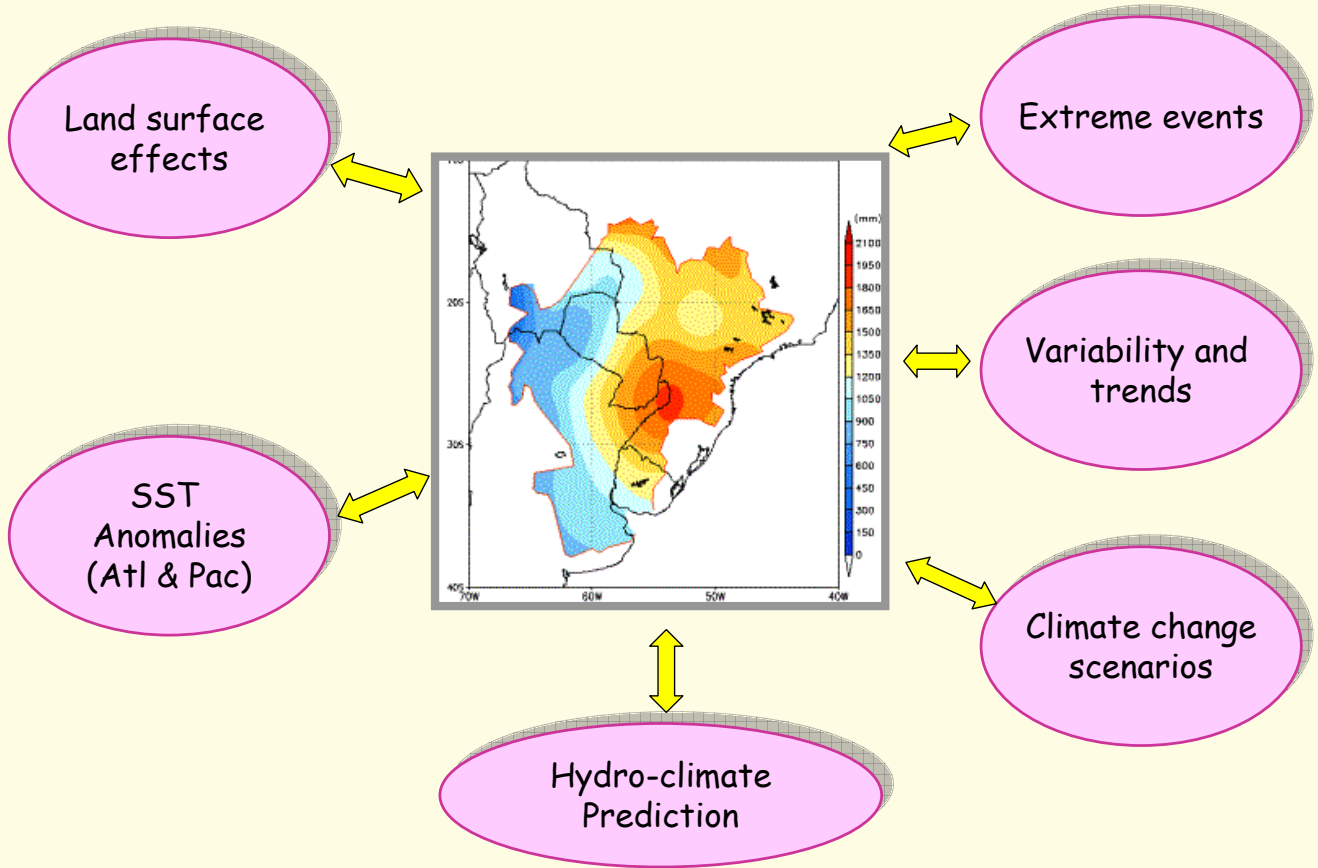
- What climatological and hydrological factors determine the frequency and spatial extent of **floods and droughts**?
- How **predictable** is the regional weather and climate variability and how predictable are their impacts on the hydrological, agricultural and social systems of the basin?
- What are the impacts of global **climate change and land use change** on regional weather, climate, hydrology and agriculture? To what extent can their impacts be predicted?

Outline of the talk

- The LPB Regional Hydroclimate Project
- Funding sources
- Land cover/land use changes in LPB
- Update on plans for monitoring and field campaign



La Plata Basin Priority areas



Implementation of LPB RHP



Data rescue efforts

Hydroclimatic monitoring

- a. A supersite + a secondary site
- b. In-situ soil moisture measurements
- c. Flux Towers
- d. Satellite products

Field Experiment (PLATEX)

Hydroclimate modeling activities

Predictability and climate change assessments

- a. Land cover/Land use
- b. Aerosol effects
- c. Climate change scenarios and regional downscaling

Capacity Building and Outreach

LPB Funding – (in progress)



Many Regional Projects

PROSUR

Other projects being developed with local support (e.g., collaborations CIMA-CPTEC...)

CLARIS - LPB

A Europe-South America Network for Climate Change Assessment and Impact Studies

IAI

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

NASA

Remote Sensing/LDAS Capacity Building

NCAR (NSF)

Collaborations during Field Experiment

CIC-GEF

Framework Program for the sustainable management of the La Plata Basin water resources, in relation to climate variability and change



CLARIS-LPB

A Europe-South America Network
for Climate Change Assessment and Impact Studies
in La Plata Basin
(Coordinator: Jean-Philippe Boulanger)



CLARIS-LPB Overarching Themes Part 1 of 2

- ▶ To provide an **ensemble of regional hydroclimate** scenarios and their uncertainties for climate impact studies.
- ▶ To project **possible scenarios in land-use evolution** for 2010-2040 and design adaptation strategies in terms of rural development for the most vulnerable areas.
- ▶ To **design strategies to adapt to the possible hydrological scenarios** and their consequences (hydropower, floods, river transportation and ecological systems in wetlands) over 2010-2040.



CLARIS-LPB Overarching Themes Part 2 of 2

- ▶ To ensure **wide dissemination of the project results to stakeholders, to the scientific community and to the public** through the project web site, the production of reports, brochures, information sheets and scientific papers, and the **organization of training activities for stakeholders**.
- ▶ To foster **long-term collaborations** between European and South American Partners (sustained beyond the project lifetime).

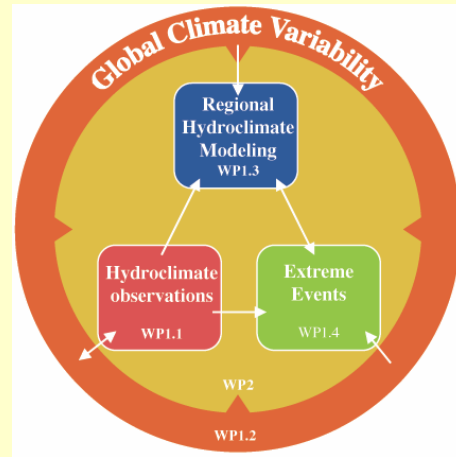
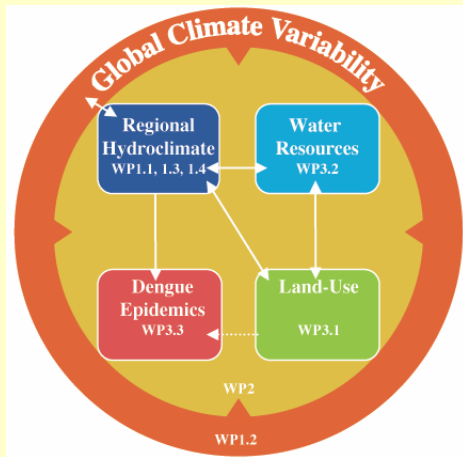


CLARIS-LPB Work Packages

- WP1: CLARIS LPB Project Management
- WP2: Dissemination activities
- WP3: Improving our description of **recent past climate variability** in La Plata Basin (instrumental and proxy data)
- WP4: Hydroclimate past and future **low-frequency variability, trends and shifts**
- WP5: **Regional Climate Change assessments** for La Plata basin
- WP6: Processes and future **evolution of extreme climate events** in La Plata Basin
- WP7: An interface for improving **prediction capability of climate change societal impacts**
- WP8: **Land use change, agriculture and socio-economic implications**
- WP9: **Water resources in La Plata Basin in the context of climate change**



CLARIS LPB: Structure



Left panel: Representation of the project general structure : Global climate (WP1.2) is considered as a driver for all the project components meaning that the feedback of the LPB region onto the global climate is not addressed.

The analysis and projection of the LPB regional hydroclimate system (see right panel) is investigated following a feedback approach with the Water Resources (WP3.2) and Land-Use (WP3.1) groups. These last two groups will also interact in order to better understand, describe and project their respective evolutions.

The regional climate will be a driver for the study and prevention of Dengue epidemics risk (WP3.3) in the region. Urbanization (land-use) may also be a factor of evolution in Dengue epidemics risk ; (Right panel) Representation of the project climate components : Global climate (WP1.2) is considered as a driver for regional hydroclimate modeling (WP1.3), but the skill of climate models in simulating the regional climate will be evaluated against observations gathered or built by the project (WP1.1).

Finally, observations (WP1.1), large-scale (WP1.2) and regional (WP1.3) climate simulations will be analyzed to better understand the possible evolution of extreme events (WP1.4) of major impacts on the LPB region.



LPB and IAI (in the works)

The Impact of Land Cover and Land Use Changes on the Hydroclimate of the La Plata Basin

Overall goal

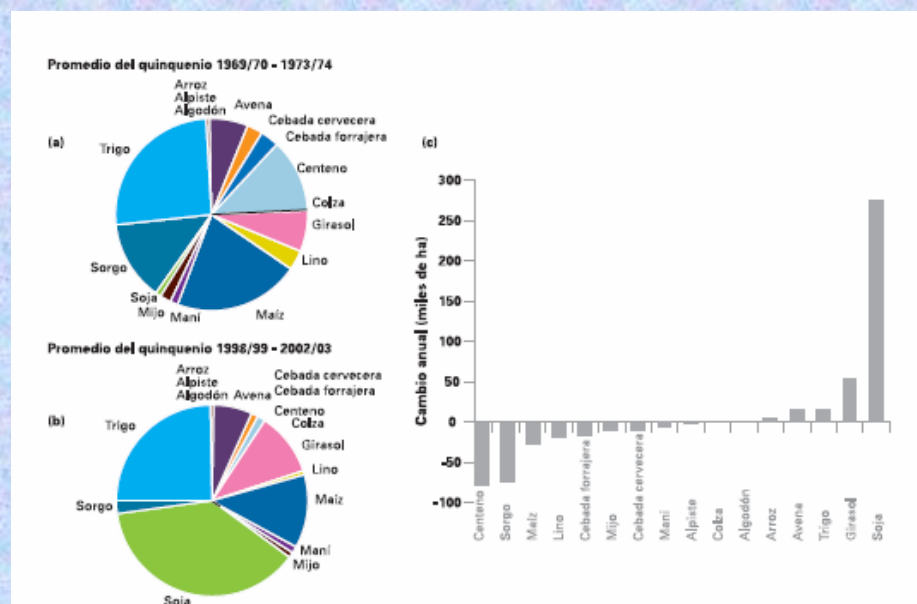
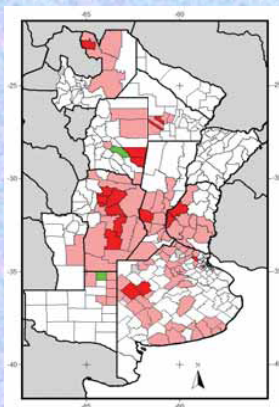
"To investigate the impact of changing land use and land cover conditions on the regional hydroclimate and extreme events of the La Plata Basin."

Motivation for the LCLUC research

Depending on their physiological properties, crops have different evapotranspiration properties, and they reflect and/or absorb radiation differently (changes in albedo), thus affecting the processes that produce precipitation.

Likewise, their roots absorb water differently, thus impacting the soil moisture, deep runoff and ultimately river flows.

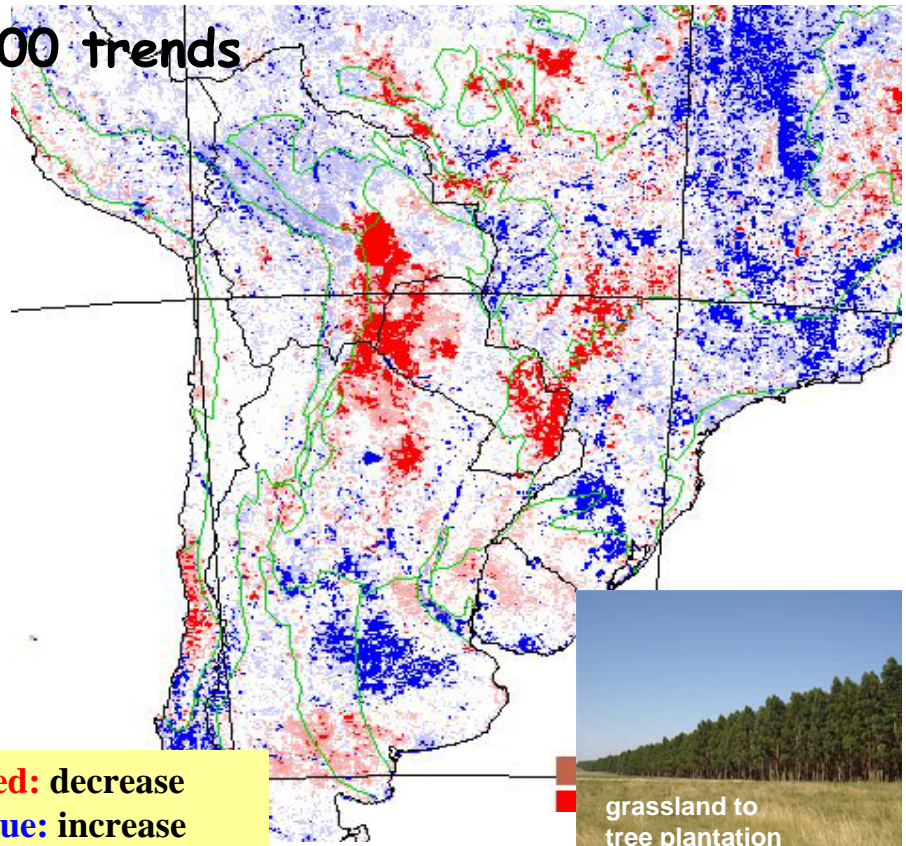
Motivation for the LCLUC research



*Characterization of land use changes
using remotely sensed biophysical variables*

NDVI 1981-2000 trends

surrogate for primary production from NOAA-AVHRR images



shifting crop systems
(X Climate?)
NDVI increase



forest to agriculture
NDVI decrease

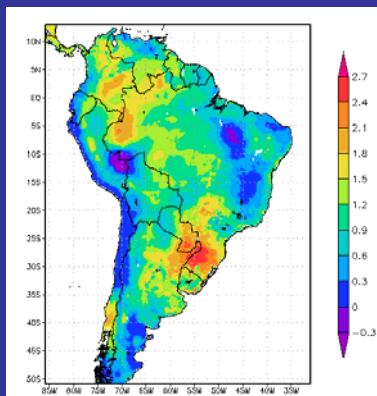


grassland to tree plantation
NDVI increase

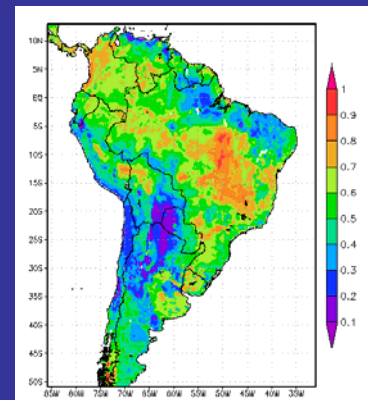
Red: decrease
Blue: increase

Normalized Difference Vegetation Index

Land Data Assimilation System with LCLUC



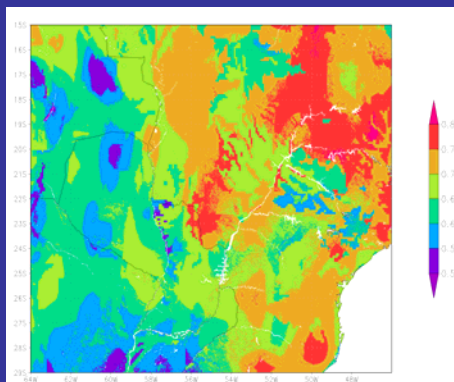
*Evaporation in Kg/m2
on December 1989
using ECMWF bias
corrected atmospheric
forcing (Berg et al.,
2005, Int. J. Clim., 25
(13), 1697-1714)*



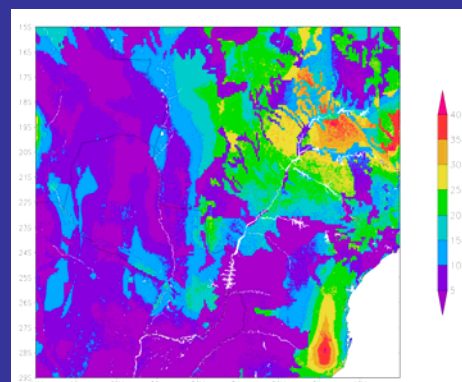
*Volumetric soil moisture
on December 1989 using
ECMWF bias corrected
atmospheric forcing
(Berg et al., 2005, Int. J.
Clim., 25 (13), 1697-1714)*

Volumetric soil moisture

Total runoff (Kg/m²)

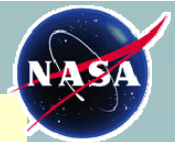


*1Km resolution -
January 2000*



Specific objectives:

1. **Develop 25 year (1980-2005) datasets from a Land Data Assimilation System** at adequate resolutions with all possible in situ and remotely sensed observations including land use and land cover changes, useful for agricultural and hydrological assessments and applications.
2. **Assess the impact of LCLU changes on the hydroclimate of the La Plata Basin**, and the physical mechanisms by which the impacts take effect, by means of regional model simulations employing the lower boundary conditions determined in Objective 1.
3. Investigate the role of LCLU changes in the intensity and length of extreme events (floods and droughts).
4. Investigate the potential changes in the hydrological character (soil moisture, infiltration, and runoff) of the La Plata Basin due to the changes in LCLU.



NASA Water Management Program Capacity Building Activities for Latin America

*"Initiate capacity building programs to develop tools for using remote sensing data in support of water management, and to show the value of Earth observations generally in water resource management. **The program will be initiated in Latin America**"*

The NASA Water Management Program may assist with LPB activities. This may include:

- 1) Assist with workshop support including the training of students;
- 2) Assist with access and application of NASA satellite and modeling products; and
- 3) Travel support to meetings including visits to the US.

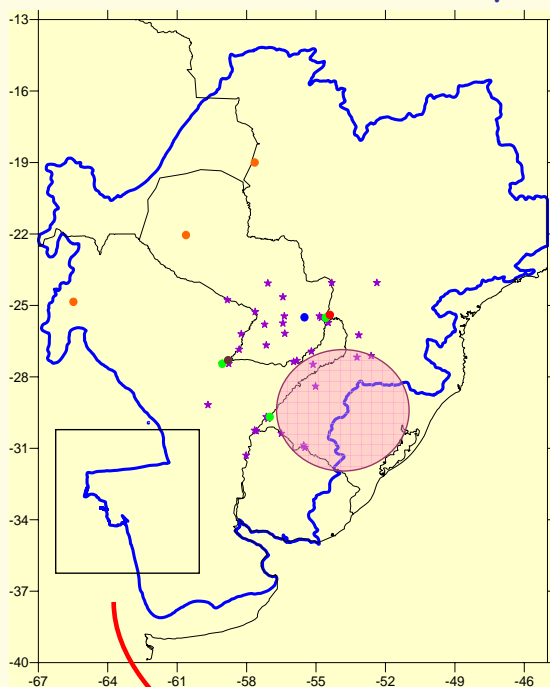
Planning meetings for the field campaign and monitoring activities

Sep 2006: First Science and Implementation Steering Group (SISG) meeting (Guaratingueta, BR)

Mar 2007: Second SISG meeting joint with IAI (Buenos Aires, AR)

Oct-Nov 2007: Planned third SISG meeting (intended at Itaipu, BR/PY)

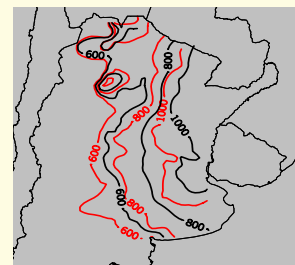
Plans for the field campaign and monitoring activities



The circle represents the primary region of study where precipitation is largest.

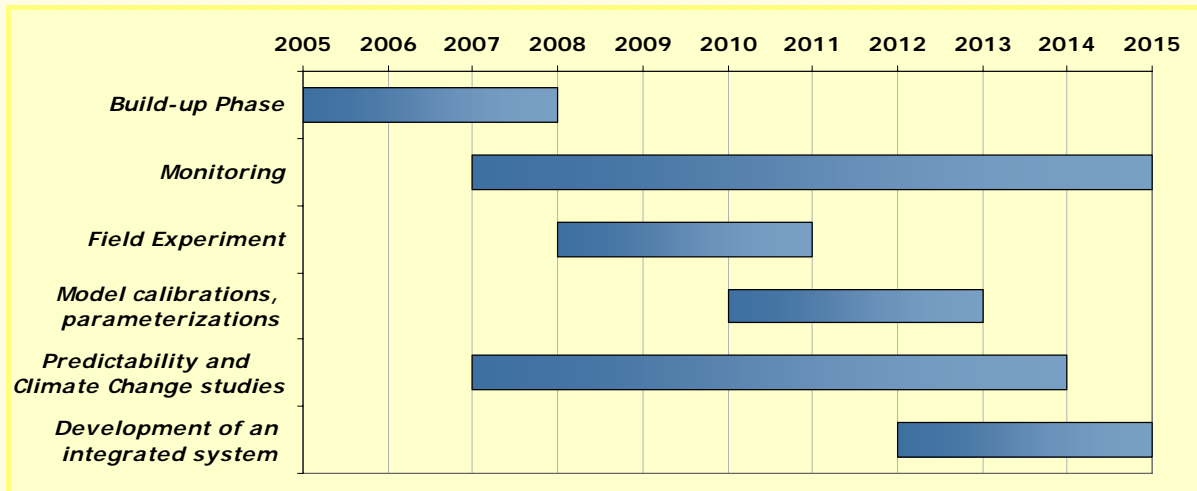
The square represents a transition region where important trends in precip have occurred. LCLU changes, are of relevance as well with important relation to the agriculture of the region

black : 1950-1969
red 1980-1999





LPB Timeline (2005-2015)



Final comments

The Good:

LPB is growing steadily in terms of science, regional participation, and visibility in international venues.

The Bad:

Planning of the monitoring and field campaign activities going slower than desired.
Need to secure funds for this component.

and The Ugly:

(Un)timely reports to CEOP

CLIMATE CHANGE IN
THE LA PLATA BASIN



■ Editors

Vicente Barros
Robin Clarke
Pedro Silva Dias



Thanks...

Useful URLs

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

-<http://www.cicplata.org>

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

-<http://www.atmos.umd.edu/~berbery/lpb>