



# La Plata Basin (LPB) Regional Hydroclimate Project

An update of activities

- Research Networks
  - EU: CLARIS-LPB
  - IAI: LCLUCs
- Educational activities

LPB's web site: <http://www.eol.ucar.edu/projects/lpb>



# LPB Projects



## Multiple Regional Projects

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

## 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/Data assimilation - Capacity Building

## CIC-GEF

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

## NCAR (NSF)

Collaborations during Field Experiment

## ARM (DOE)

Collaborations during Field Experiment



# CLARIS | LPB

HYDRO-CLIMATE AND SOCIETY IN LA PLATA BASIN

A Europe-South America Network for  
Climate Change Assessment and Impact Studies  
in La Plata Basin

A project within the EC 7th Framework Programme

1 October 2008 to 30 September 2012

Coordinator: Dr. Jean-Philippe Boulanger (IRD; [jpb@locean-ipsl.upmc.fr](mailto:jpb@locean-ipsl.upmc.fr))

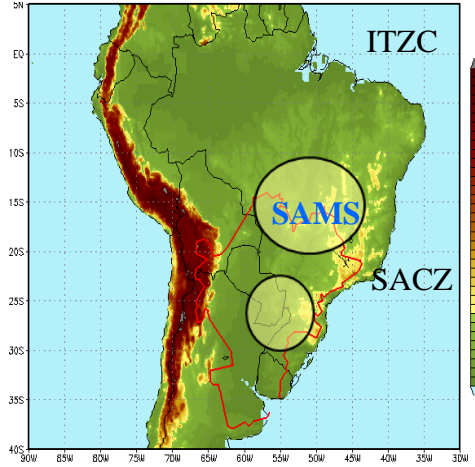


<http://www.claris-eu.org>



# The CLARIS LPB Project aims at

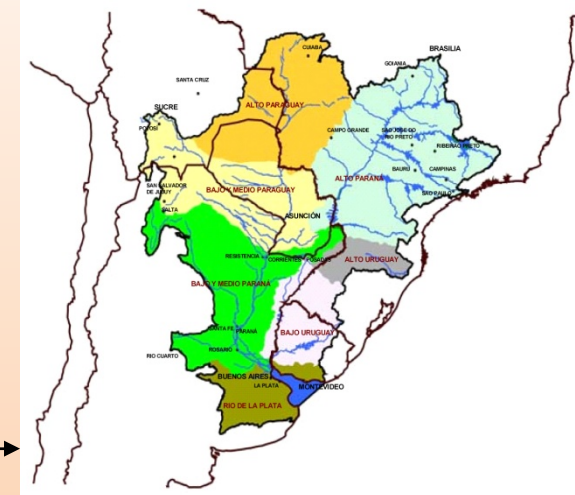
## Predicting the regional climate change impacts on the La Plata Basin



## Designing adaptation strategies for

Land-use  
Agriculture cropping systems  
Rural development

Hydropower production  
River transportation  
Water resources  
Ecological systems in wetlands





CLARIS | LPB

HYDRO-CLIMATE AND SOCIETY IN LA PLATA BASIN

# CLARIS LPB PARTNERS



## CLARIS LPB

- 10 countries, 20 institutions -

# CLARIS LPB Four Major Tasks

1. **Improving the description and understanding of decadal climate variability for short-term regional climate change projections (2010-2040).**
2. **Improving the prediction capacity of climate change and its impacts in the region, through an ensemble of coordinated regional climate scenarios in order to quantify the amplitude and sources of uncertainties in LPB future climate at two time horizons: 2010-2040 for adaptation strategies and 2070-2100 for assessment of long-range impacts.**
3. **Designing adaptation strategies to regional scenarios of climate change impacts, through a multi-disciplinary research and trans-sectorial (i.e. with public and private actors) approach**
4. **Involving and integrating stakeholders in the design of adaptation strategies through an interactive and communicative process, ensuring their dissemination to public, private and governmental policy-makers.**

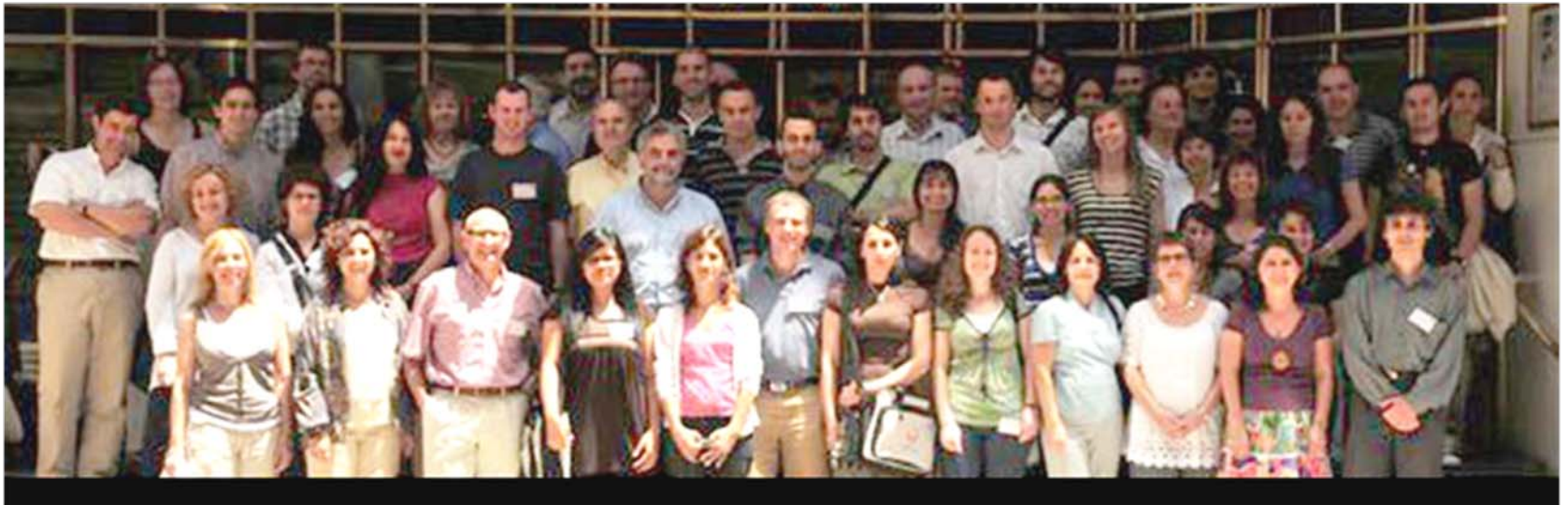




## Subproject 2: Past and future hydroclimate

## Subproject 4: Socio-economic scenarios and adaptation/ prevention strategies

- **WP3:** Improving our description of recent past climate variability in La Plata Basin
- **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
- **WP8:** Land use change, agriculture and socio-economic implications
- **WP9:** Water resources in La Plata Basin in the context of climate change



## **CLARIS-LPB Meetings**

**1Nov 08, Buenos Aires: Kick-off meeting with the participation of over 80 scientists from the participating institutions**

**2May 09, Lund: Regional climate change and downscaling (WP-5).**

**3Jun 09, Curitiba: Water resources (WP-9).**

**4Sep 09, Paris: Variability, trends and jumps (WP-4).**





# IAI Cooperative Research Network:



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



### Participants

Univ Maryland (US)  
Univ Washington (US)  
NASA (US)  
Univ Florida (US)  
Univ Miami (US)  
Univ Almeria (SP)  
INPE/CPTec (BR)  
Univ San Luis (AR)  
Univ Catol Asuncion (PY)  
U Passo Fundo (BR)  
Univ Sao Paulo (BR)  
U Buenos Aires/Agronomy (AR)  
UBA/Sociology (AR)  
CIMA (AR)

First PI's meeting in  
Florianopolis, Brazil,  
March 2009.



## Cooperative Research network: The Impact of Land Cover and Land Use Changes on the Hydroclimate of the La Plata Basin



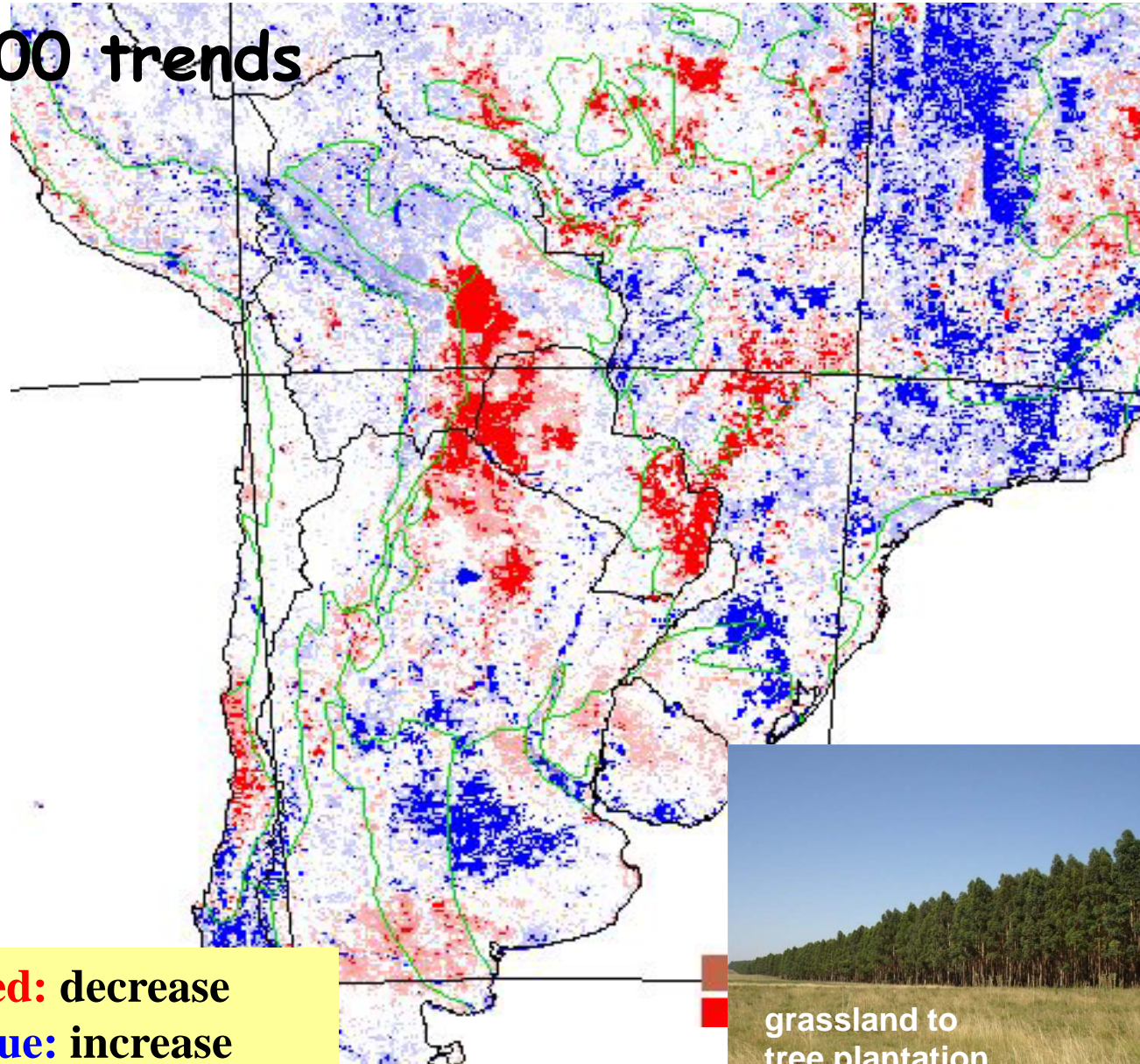
1. Assess the impact of LCLU changes on the hydroclimate of the La Plata Basin, and the physical mechanisms by which the impacts take effect.
2. Investigate the role of LCLU changes in the intensity and length of extreme events (floods and droughts).
3. Investigate the potential changes in the hydrological character (soil moisture, infiltration, and runoff) of the La Plata Basin due to the changes in LCLU.
4. Evaluate yield forecasts based on the combination of climate regional circulation models with crop models



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

# NDVI 1981-2000 trends

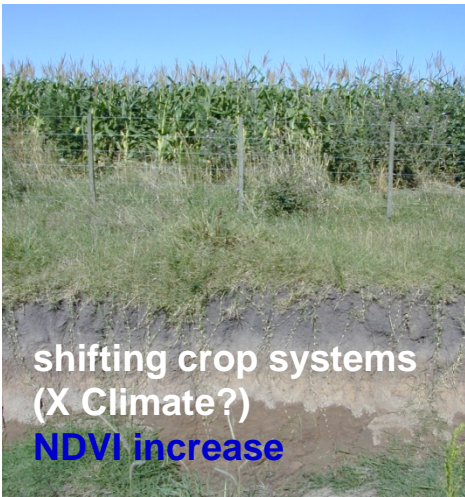
surrogate for primary  
production from  
NOAA-AVHRR images



**Red:** decrease

**Blue:** increase

Normalized Difference Vegetation Index



shifting crop systems  
(X Climate?)  
NDVI increase



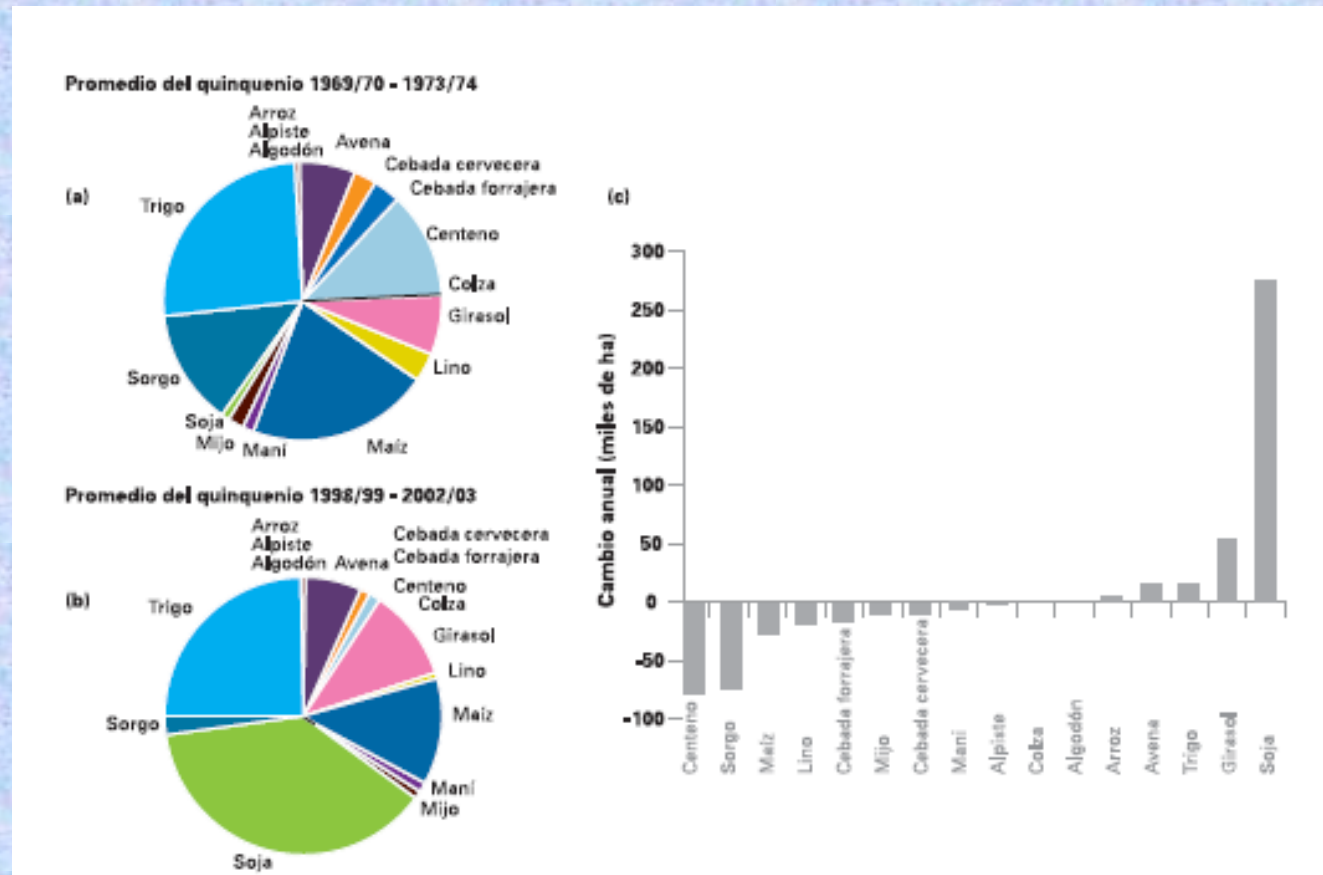
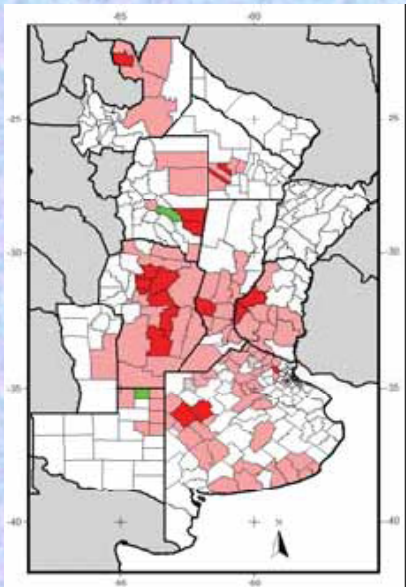
forest to agriculture  
NDVI decrease



grassland to  
tree plantation  
NDVI increase



# Motivation for the LCLUC research

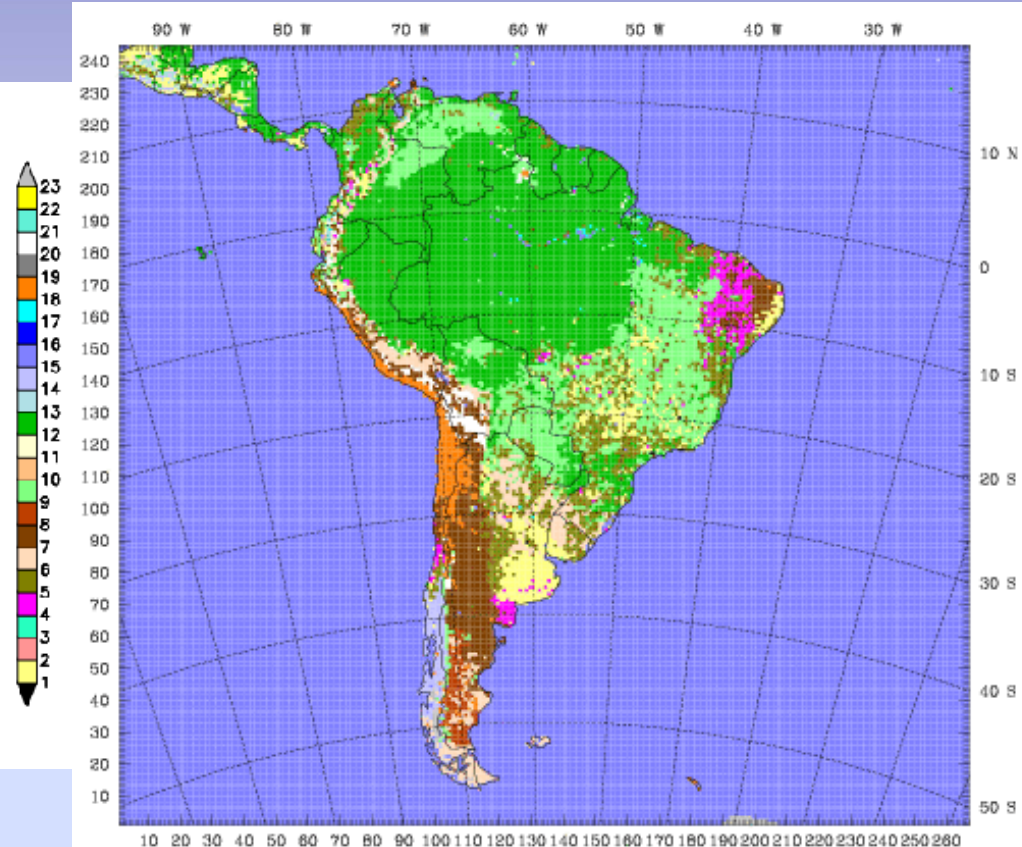


Courtesy of J. Paruelo, E. Jobbagy

# Land use – land cover in current models

## Land Use Category

- |  |                                 |
|--|---------------------------------|
| 1 Urban and Built-Up Land                      | 13 Evergreen Broadleaf Forest   |
| 2 Dryland Cropland and Pasture                 | 14 Evergreen Needleleaf Forest  |
| 3 Irrigated Cropland and Pasture               | 15 Mixed Forest                 |
| 4 Mixed Dryland/Irrigated Cropland and Pasture | 16 Water Bodies                 |
| 5 Cropland/Grassland Mosaic                    | 17 Herbaceous Wetland           |
| 6 Cropland/Woodland Mosaic                     | 18 Wooded Wetland               |
| 7 Grassland                                    | 19 Barren or Sparsely Vegetated |
| 8 Shrubland                                    | 20 Herbeceous Tundra            |
| 9 Mixed Shrubland/Grassland                    | 21 Wooded Tundra                |
| 10 Savanna                                     | 22 Mixed Tundra                 |
| 11 Deciduous Broadleaf Forest                  | 23 Bare Ground Tundra           |
| 12 Deciduous Needleleaf Forest                 | 24 Snow or Ice                  |

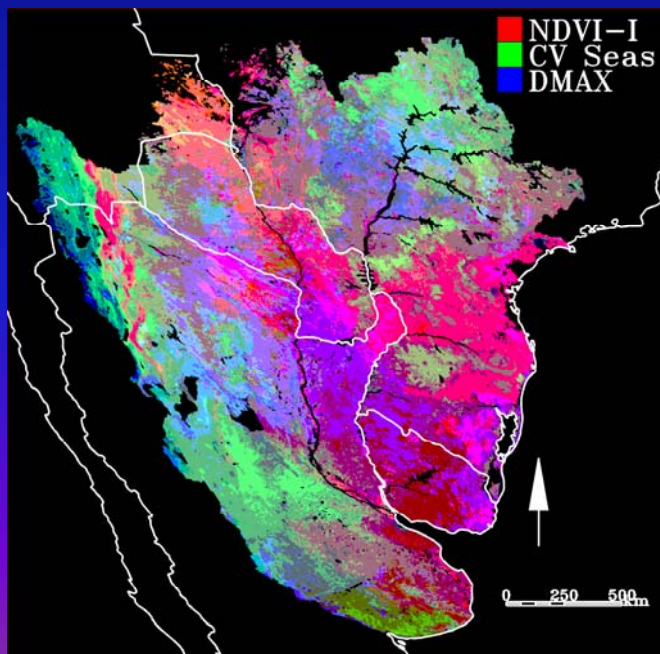




**I. Ecosystem Functional Types (EFTs):** an approach to assess and monitor the spatial heterogeneity of ecosystem functioning (C gains)

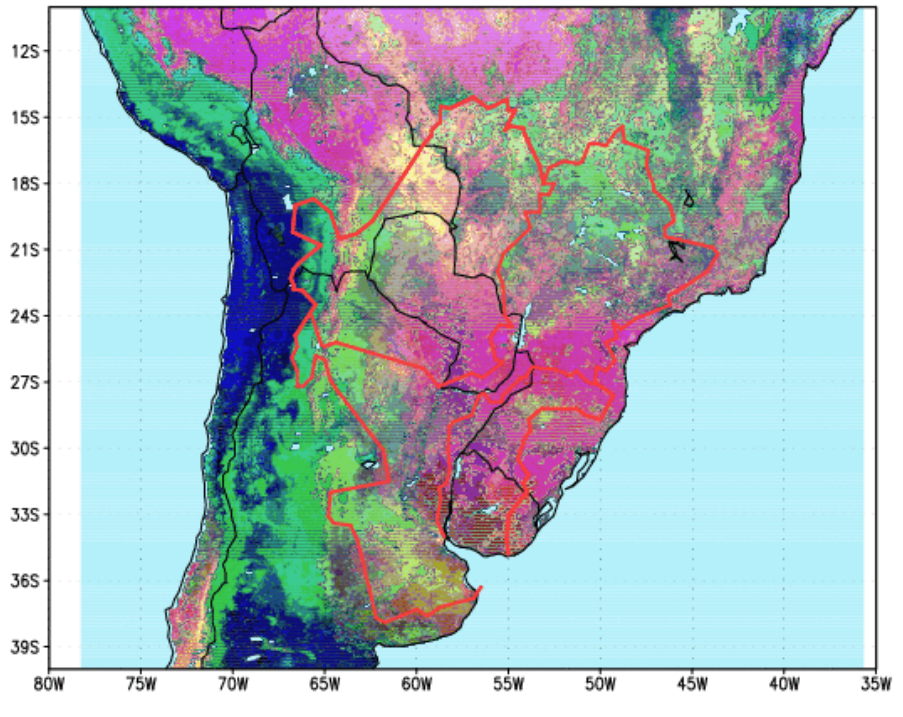
**II. Characterizing ecosystem functioning**

**III. Assessing EFTs in the Río de la Plata basin through satellite imagery**

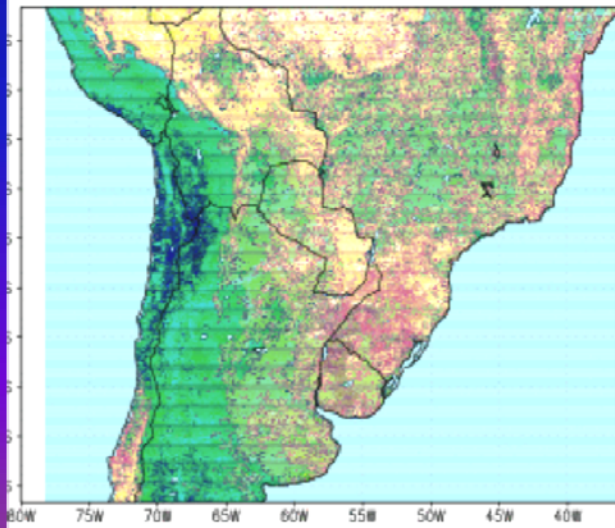


*Ecosystem Functional Types of La Plata Basin based on three descriptors of the seasonal dynamics of the NDVI estimated from MODIS images for the 2000-2006 period. NDVI-I (NDVI annual integral, CV\_Seas (annual coefficient of variation), DMAX (Date of the Maximum NDVI).*

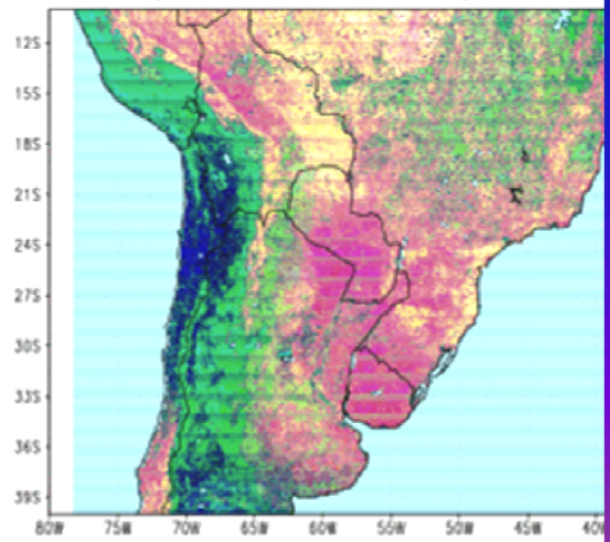
EFTs  
Mean 1982-1999



Ecosystem Functional Types 1988



Ecosystem Functional Types 1999



## *Education and outreach*

A capacity building course **aimed at graduate students and young scientists** will take place later this year at the Itaipu Hydropower Plant in the Brazil-Paraguay border. **The course will focus on land cover changes, land-atmosphere interactions and their effect on the Climate and Hydrology of the La Plata Basin.** It will provide

- (1) a physical/theoretical background,
- (2) current research methods,
- (3) relate to activities at operational centers, and
- (4) train students in practical tools (software) that they will need for their future research.

## CAPACITY BUILDING: Itaipu, Nov 2009.

The syllabus includes:

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

Applicants: ~90

Brazil: ~35

Argentina: ~20

Paraguay: ~2

Bolivia: ~2

Other countries: ~30