La Plata Basin (LPB)
Regional Hydroclimate Project

An update of activities

Outline

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

- Monitoring activities in LPB RHP

LPB’s web site: http://www.eol.ucar.edu/projects/lpb
LPB Funding – (update Mar ‘09)

**CLARIS - LPB**
A Europe-South America Network for Climate Change Assessment and Impact Studies - ~ € 3.35M

**IAI**
Ecosystems, Biodiversity, Land Use and Cover, and Water Resources > $2.0 M

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

**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) [+ 45 M in kind contrib.]

**NCAR (NSF)**
Collaborations during Field Experiment

**NASA**
Remote Sensing/Data assimilation - Capacity Building

**ARM (DOE)**
Collaborations during Field Experiment
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)

Project Officer: Dr. Philippe Tulkens
The CLARIS LPB Project aims at predicting the regional climate change impacts on 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 PARTNERS

- 10 countries, 20 institutions -
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 Four Major Tasks

<table>
<thead>
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<th>Task</th>
<th>Description</th>
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<tr>
<td>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.</td>
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1. Forming young scientists in South American and European institutes

2. Strengthening the collaborations between European and South American partners.
1 Regional climate change and downscaling

Regional climate model scenarios (A1B)
1990-2005 (ERA-Interim), GCMs
2010-2040
2070-2100

Metrics

2 Process studies

Land-Atmos feedbacks
Vegetation/land use
Soil moisture

REGION: SOUTH AMERICA
~90W-32W; 58S-12N
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.

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)
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

greenland to tree plantation
NDVI increase
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).*
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.

The proposed syllabus includes:

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

Activities being carried out at operational centers

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

An LPB-IRI cooperation agreement has been signed
Example 1: Basin averages.
180-day accumulated P (% of normal)
1MAR08 – 16AUG08
Example 1’:
GFS ensemble forecasts
Accumulated P (% of normal)

Week 1

NCEP GFS Ensemble Forecast 1–7 Day Precipitation (mm)
from: 21Aug2008   for La_Pla_de_Basin

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_Pla_de_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

Ensemble Forecasts
Example 3: Products at SMN(AR)
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.