Variability of the American Monsoon Systems

A WCRP/CLIVAR program focused on the climate of the Americas

Chair’s Report

VPM7
Guayaquil, Ecuador, March 2004

C. R. Mechoso
Implementation

- Science components
  - North American Monsoon Experiment (NAME), currently coordinating NAME04
  - Monsoon Experiment South American (MESA), coordinated SALLJEX and sponsors the PLATIN SSG
  - VAMOS Oceans-Clouds-Atmosphere Land Studies (VOCALS)
- Dataset Development
  - VAMOS database
- Projects Support
  - VAMOS Project Office
VAMOS Programs 2004
Implementation highlights

• NAME
  Plans for NAME 2004 Field campaign well underway and partially funded.

• MESA
  SALLJEX data analysis in progress. The PLATIN SSG participates in a GEF-funded project.

• VOCALS
  Instrumentation installed in Chilean Island. Plans for a Research Program in the Eastern Pacific are underway.
NAME ACTIVITIES (2003-04)

• Ocean Processes:
  – Ocean Component of NAME Workshop (Ensenada, Apr 03)

• Land Surface Processes:
  – Soil Moisture Field Experiment (SMEX 04) funded (NASA THP) (Apr 03)
  – NAME Hydrometeorology Working Group formed (Jan 03)

• Modeling:
  – Modeling and Data Assimilation Workshop (College Park, Jun 03)
  – Modeling and Data Assimilation Strategy Document (Jun 03, revision in progress)

• NAME 2004:
  – NAME 2004 Solicitation (NOAA PACS/GAPP, May 03)
  – NAME International Project Support Team meeting (May 03)
  – NAME Forecast Operations Centers Exchange Visits and Forecasting (Summer 03)
  – NSF Briefing on Tier 1 Observations (Washington DC, Mar 03)
  – OAR HQ Briefing on Ships and Aircraft (Washington DC, May 03)
  – NWS HQ Briefing on NAME Soundings (Washington DC, Dec 03)
  – NAME Special Session and SWG-5 Meeting (Puerto Vallarta, Nov 03)
“White Paper” on DATA ASSIMILATION

NAME Modeling and Data Assimilation
A Strategic Overview

NAME Science Working Group*
2003

- Provides a strategy for accelerating progress on the fundamental modeling issues pertaining to the NAME science objectives
- Reviewed by the US CLIVAR Pan American Panel.
- Emphasizes activities that bring observationalists, modelers and physical parameterization experts together to focus on key physical processes that are deficient in coupled models.
Post-field Campaign Activities (2003-2004)

• Data collection and quality control
• Data analysis & diagnostic studies
• Modeling experiments
• SALLJEX Data Workshop (Buenos Aires, Argentina, 10-12 Dec 2003)
• SALLJEX participates in the development of GCOS action plan for South America
DISTRIBUTED SALLJEX LONG-TERM DATA ARCHIVE

- SALLJEX Preliminary Master Dataset List
- U.S. Data Center - CODIAC Interactive Data Management System located at the University Corporation for Atmospheric Research (UCAR) Joint Office for Science Support (JOSS), Boulder, Colorado, USA.
- SALLJEX On-line Field Catalog (including preliminary products)

DATA SUBMISSION

- SALLJEX Data Submission Instructions
- SALLJEX Data Submission Guidelines

DOCUMENTS

- SALLJEX Data Policy
- SALLJEX Data Management Plan
The PLATIN Science Study Group

La Plata Basin is a climate-hydrology system with components that are potentially predictable with useful skill from seasons in advance, and whose variability has important impacts on human activities.

CLIVAR and GEWEX formed the PLATIN Science Study Group to advance the understanding of those components.

Membership (as in January 2004)

**PLATIN SSG:** Walter Baetghen (IFDC, Uruguay), Julian Baez (DINAC, Paraguay), (Vicente Barros (UBA, Argentina), E. Hugo Berbery (U. Maryland, USA), Alexandre Guetter (SIMEPAR, Brazil), Dennis Lettenmaier (U. Washington, USA), C. Roberto Mechoso (Co-Chair, UCLA, USA), Edgard Montenegro (U. Cochabamba, Bolivia), Andrew W. Robertson (IRI, USA), Pedro Silva-Dias (Co-Chair, USP, Brazil), Rafael Terra (U. Republic, Uruguay), Carlos Tucci (USP, Brazil).

**ICPO Contact:** Carlos Ereño (ICPO, Argentina)
La Plata Basin Climate and Hydrology Project

LPBP aims to improve understanding and prediction of La Plata Basin’s climate and hydrology based on their unique sensitivity to the variability of remote climates, regional geographic features and connections with the large Amazon basin.

LPBP is the most recent Continental Scale Experiment (CSE) approved by the GEWEX SSG as a collaborative effort with CLIVAR.
LPBP Compliance with GEWEX CSE Technical Requirements

• CPTEC and IRI, both NWP and climate prediction centers, have committed cooperation with LPBP. Several national and international sources provide funds for LBP research. PLATIN participates in a GEF-funded project, which focuses on improving prediction of Climate Variability and Change Impacts on LPB Hydrology.

• LPBP includes several monitoring and experimental networks (e.g. PACS SONET, SALLJEX), as well as flux towers. The VAMOS Database at UCAR JOSS coordinates data management support.

• LPBP’s data policy is inspired by CEOP and been used in SALLJEX. It commits researchers to participate in the international exchange of scientific information and data in conformity with the general practice of WCRP.

• The GEF-funded initiative for the basin in which PLATIN participates also involves water resource agencies and other groups that examine impacts on regional water resources.

• LPBP activities are contributing to the evaluation of GEWEX global data products by generating in-situ data. The contribution will expand by using the products in numerical modeling studies.

• Models and data bases used in GAPP are been transferred to LPB. Strong collaborations with LBA are anticipated.
U. Sao Paulo – FAPESP Flux Towers
U. Sao Paulo – Sao Paulo State Research Foundation
Dr. Humberto Rocha -PI

<table>
<thead>
<tr>
<th>Site</th>
<th>Vegetation cover</th>
<th>Beginning of operations</th>
<th>Tower height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sertãozinho</td>
<td>Sugar cane</td>
<td>1996</td>
<td>7 m</td>
</tr>
<tr>
<td>21º06'S, 48º04'W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Santa Rita P. Quatro,</td>
<td>Natural savannah</td>
<td>2001</td>
<td>25 m</td>
</tr>
<tr>
<td>21º37'S, 47º38'W</td>
<td>(cerrado)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luiz Antônio</td>
<td>Eucalyptus plantation</td>
<td>2003</td>
<td>4-45 m</td>
</tr>
<tr>
<td>21º35'S, 47º36'W</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Instrumentation:**
Aspirated Psychrometers (CSI 107)
Wind speed and Direction (RM Young)
Soil heat flux plates (REBS) and temperature probes (CSI 108B)
Precipitation (Texas 525)
Global (Licor) and Net Radiation (REBS) Flux Densities
Three-dimensional asymmetric sonic anemometer (Gill Solent)
H2O/CO2 Infra-red Gas Analyser (Licor 6262)
Leaf area counter Licor 3000
Optical canopy images digitizer CI-100 (CID)
Soil respiration chamber SRC-1 (PPSystems)
Soil moisture neutron probe CP Boart Longyear
Climate monitoring at INIA — Uruguay

Instituto Nacional de Investigaciones Agropecuarias

Data: Daily and monthly-mean air temp., rel. humidity, precip., evap., wind, hours of insolation and potential evap.

www.inia.org.uy
La Plata River Basin Project (PLATIN)

Overview

* CLIVAR/VAMOS identified the Río La Plata Basin as a climate-hydrology system with components that are potentially predictable with useful skill from seasons in advance, and whose variability has important impacts on human activities.

* PLATIN provides a framework for integration of regional projects leading to improved predictions of the climate and hydrology system, and the coordination of those projects at the highest international level (WMO/WCRP).

* PLATIN can act as an advocacy group to agencies that provide funding for science projects and the strengthening of the scientific infrastructure.

* PLATIN aims to enhance the scientific infrastructure in the Plata Basin in agreement with producers and users of climate information.

www.joss.ucar.edu/platin
A GEF-Supported Project Will Fund Initiatives on LPB Climate and Hydrology

<table>
<thead>
<tr>
<th>Requesting Agency:</th>
<th>United Nations Environment Programme (UNEP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Exec Agency:</td>
<td>Intergovernmental Coordinating Committee for La Plata Basin (CIC), in co-operation with water agencies of Argentina, Bolivia, Brazil, Paraguay, and Uruguay</td>
</tr>
<tr>
<td>Executing Agency:</td>
<td>Organization of American States (OAS)</td>
</tr>
<tr>
<td>Funding Agency:</td>
<td>Global Environment Facility (GEF)</td>
</tr>
<tr>
<td>Current Status:</td>
<td>Preparation phase 11/1/03-4/30/05</td>
</tr>
<tr>
<td>Preparation Cost:</td>
<td>US $1,376,100 (US $700K GEF Block B; $676K Other Sources, including WMO)</td>
</tr>
<tr>
<td>Project Total Cost:</td>
<td>GEF has placed $15M on Reserve; Countries and Other Sources may contribute 2:1 for a potential total of US $45M.</td>
</tr>
</tbody>
</table>

PLATIN has been allocated US $150K in 2004
Sub-Activity 2a - Preparatory Surveys

Coordination Group

General Coordinator (Sub-activity 2a.1):
Dr. C. Roberto Mechoso

Experts by countries:
Dr. Vicente Barros (Argentina)
Dr. Edgard Montenegro (Bolivia)
Dr. Pedro Silva Dias (Brasil)
Ing Julián Báez (Paraguay)
Dr. Rafael Terra (Uruguay)

Theme 1
Characterization of LPB Climate and Hydrology
Sub-Activity 2a.2
Responsible: Vicente Barros (Argentina)
Collaboration Group: Javier Tomasella (Brasil), Alice Grimm (Brasil), Gabriel Pisciottano (Uruguay).
Reviewer: Mario Nuñez (Argentina)

Theme 2
Numerical Models for Prediction of Climate and Hydrology
Sub-Activity 2a.3
Responsible: Pedro Silva Dias (Brasil)
Collaboration Group: E. Hugo Berbery (EEUU-Argentina), Carlos Tucci (Brasil), Rafael Terra (Uruguay)
Reviewer: Eugenia Kalnay (EEUU)

Theme 3
Extreme Climate and Hydrology Events
Sub-Activity 2a.4
Responsible: José Marengo (Brasil)
Collaboration Group: Angel Menendez (Argentina), Alexander Guetter (Brasil), Edgard Montenegro (Bolivia)
Reviewer: Terri Hogue (EEUU)

Sub-Activity 2a.5
Responsible: Edgard Montenegro (Bolivia)

Theme 4
Technical Bases and Instrumentation
Sub-Activity 2a.6
Responsible: Walter Baethgen (Uruguay)
Collaboration Group: Julián Baez (Paraguay), Carolina Vera (Argentina), Carlos Morales (Brasil), Roger Domecq (Paraguay)
Reviewer: Vernon Kousky (EEUU)

Sub-Activity 2a.7
Responsible: Julian Baez (Paraguay) Collaborator: Roger Domecq (Paraguay)
Sub-Activity 2b - Development of Implementation Plans

Sub-Activity 2b will be organized in 3 teams:

1. Plan for Implementation of a System for LPB Climate/Hydrology Prediction

2. Plan for Implementation of Methodologies to Include Climate Information in LPB Water Management Strategies

3. Plan for Development of a Model to Predict Land Use/Land Cover Change Impacts on LPB Ecosystems

Components 2.2 and 2.3 will have input from RIGA and AAAS, respectively.
VOCALS
Scientific Issues

- Time and space scales of Cloud-Topped Boundary Layer (CTBL) - continent interaction.
- Regional seasonal/interannual feedbacks between stratocumulus clouds, surface winds, upwelling, coastal currents and SST in the Eastern Pacific.
- Feedbacks of Eastern Pacific cloud topped boundary layer properties on overall tropical circulation and ENSO.
- Climatic importance of aerosol-cloud interactions.
Coastal jet
Ocean heat transport
Cloud microphysics gradient
cold eddies
Diurnal Subsidence Wave

3200 km
Scientific Highlights from EPIC & DYCOMS
U. Chile has installed ceilometer and surface met at San Felix Is.

Shows daytime rise of LCL, cloud base, with synoptic variations.

R. Garreaud
U. Chile
2003-2010
diagnostic/modeling work
2003 ETL-enhanced cruises
SFI profiler
VEPIC data archive
2004/11 Cloudsat
2005/01 RICO
2006 VEPIC Field Exp.
in the Eastern Pacific.
CEOP ORGANIZATION STRUCTURE

Science Steering Committee
- guide/oversee the science implementation
- maximize the scientific and technical benefits

- WCRP: H.Grassl
- GEWEX: S.Sorooshian
- CLIVAR: C.R. Mechoso
- CliC: B. Goodison
- WGNE: K. Puri
- GHP Chair: J. Roads
- GAME: T. Yasunari
- IGOS-P: R. Lawford (Water Theme Rep)
- Leading Scientist: T.Koike

Advisory/Oversight Committee
- receivers of scientific ideas for funding and support
- providers of reality checks on funding, infrastructure
- membership criteria (provides data or funds efforts)

- Co-chair: J.Kaye (NASA) & A.Sumi (JAXA)
- Delegates from WCRP, Space Agencies, and other Sponsoring Organizations.

Coordination Body
- keep communication flowing: newsletter, web, teleconference, meeting, etc.
- International Coordinator: S.Benedict
- Implementation Coordination Group: CSE Representatives and S.Williams

Working Groups

Water and Energy Simulation & Prediction
- Co-chair: J. Roads & J. Marengo
  - R.Stewart, Carl Fortelius, T.Lebel, T.Oki

Satellite Data Integration
- Chair: T.Koike & P.Houser
  - G.Stephens(GEWEX), A.Walker(CliC), J.Fischer, M. Chahine(Aqua/AIRS)
  - CEOS WGISS: S.Sobue
  - EOS WGCV: V.Desnos
  - Validation scientists of TRMM, Terra, Aqua, ADEOS-II, ENVISAT

Monsoon Systems
- Co-chair: W.Lau & J.Matsumoto
  - H.Berbery, W.Higgins, T.Lebel, R.Mechoso, J. Marengo, M.Bollasina

Data Management
- Co-chair: S.Williams & H.Isemmer
  - B.Crawford, T.Lebel, K.Takahashi, L.Horta, U.Schneider, T.Maurer, EColtoun

Model Data Management
- Co-Chairs Bosilovich and Lautenschlager and Reps from ECMWF, JMA, CPTEC, CMA, MPI, ECPC, UK Met, NCMRWF, GMAO, and NCEP
CEOP Monsoon System Study Framework

The A⁴ monsoon: Asian, Australian, American (North and South) and west African

Figure 6-1. CEOP Monsoon Systems Studies
A GEWEX-CLIVAR Cooperative Activity

- Core Monsoon Experiments
- Regional Monsoon Experiments
- Asia- Australia CAMP
- North America NAME
- South America MESA
- West Africa AMMA

- Analysis
  - 2-yr. synoptic climate case study
    - temporal variability diurnal to annual
    - comparative assessment
      -- among monsoon systems
      -- with long-term climate.

- Predictability
  - Studies using opnl models
  - Studies using CEOP Reanalysis
    - CIOPPS: CEOP Intra-seasonal
    - Oscillation Predictions - Pilot studies.

- Impacts & Teleconnections
  - MICAPS: Monsoon Impacts on Continual Areas-Pilot Studies
    - Case studies with 2- yr. data
    - Regional Reanalysis studied e.g. Eta
    - Global Reanalysis studies e.g. ERA-40

ÅIO Monitoring
Relevance to Applications

• NAME projects have involved the applications community from the beginning. NAME04 will select and instruct cooperative observers (ranches, schools, health clinics, public facilities, etc.) and install raingauges for monitoring. The “Teacher in the Field” opportunity of NOAA OGP will sponsor the participation of 2 teachers (K-16).

• The UNEP/OAS/CIC multi-national project, in which the PLATIN SSG participates, will plan and implement strategic actions to be taken by the governments of countries in La Plata Basin for the environmentally and socially sustainable economic development of the basin.
Issues and Challenges

• Relations with WMO Centers
  A closer cooperation between WCRP and WMO would greatly benefit VAMOS. NAME has demonstrated that such a collaboration could be achieved on a one-to-one basis. SALLJEX found that it is difficult to achieve it in a multi-country region. PLATIN is showing that mechanisms to address this problem are not clearly defined.

• Relations with GEWEX Panels
  The approaches to GEWEX by NAME (GAPP) and MESA (PLATIN SSG) have been warmly received. VAMOS looks forward to collaborating with the GHP and the GEWEX modeling panels.
Challenges for a mature VAMOS

- **Science Goals**
  What are the overarching science questions to be addressed in reference to the climate of the Americas, particularly during the warm season?

- **Modeling**
  What will be the focus of VAMOS modeling? In which aspects will VAMOS modeling contribute to a better simulation and numerical prediction of the monsoon systems?
Special Acknowledgements

Programs and Agencies: D. Legler (US CLIVAR), Jin Huang (NOAA OGP), J. Rucks (OAS)
Project Officers: A. Villwock, C. Ereno, G. Emmanuel
UCAR JOSS: S. Williams, J. Meitin
Summary

- VAMOS is one of the WCRP flagships; it is consistently mentioned as an example of what a WCRP program should be.
- VAMOS has achieved a stable configuration based on NAME, MESA and VOCALS; it has a Project Office and enjoys database support and is well-positioned for the future.
- A major international field campaign was completed with great success (SALLJEX); another is in the waiting cue (NAME 04).
- VAMOS, a CLIVAR panel, has strong ties with GEWEX. These ties will be tighter in the future.
- The VAMOS domain covers two monsoon systems and CSEs, and one of the most interesting sectors of the world’s ocean.
- Challenges are great, but the potential contributions to progress in science through coordination and encouragement are enormous.