MESA
Monsoon Experiment
over South America

Carolina Vera
CIMA/University of Buenos Aires
Buenos Aires, Argentina
1) a better understanding of the South American monsoon system and its variability,

2) a better understanding of the role of that system in the global water cycle

3) improved observational data sets, and

4) improved simulation and monthly-to-seasonal prediction of the monsoon and regional water resources.
SALLJ Science goal

To understand the role of the South American low-level jet in moisture and energy exchange between the tropics and extratropics and related aspects of regional hydrology, climate and climate variability.
SALLJEX Upper-air network

- Quantification of the SALLJ intensity on a daily basis.
- Diurnal variations of the SALLJ
- Structure of the Chaco heat low

PIBAL Network

Radiosonde Network
NOAA/P3 Missions in SALLJEX

- Detailed description of the 3-dimensional structure of the SALLJ
- The relationship between MCS and the SALLJ
- Structure of cold frontal surges near the eastern slopes of the Andes
- Description of mesoscale winds and moisture variability over the Altiplano
- Description of the heat low over the Chaco and NW Argentina
• Determination of wet and dry periods during the experiment and their relationship with SALLJ events

• Providing ground truth estimates for comparison with a hierarchy of numerical simulations of rainfall in the region.

• Determining the accuracy of satellite-rainfall estimates over the region.
SALLJEX Modeling Group

Models running at: CPTEC and Univ. of São Paulo (Brazil), CIMA and UBA (Argentina), Univ. of Maryland and Univ. of Utah (USA), Univ. Of Chile (Chile) participated in modeling activities during and after the field campaign.
SALLJEX Post-Field Activities

• March 2003-: Data collection and quality control
• March 2003-: SALLJEX database construction
• March 2003-: SALLJEX related research starts
• May 2003-: SALLJEX numerical experiments
• 31 January 2004: CLIVAR Exchanges issue for SALLJ
• SALLJEX related posters to the CLIVAR Conference
• VAMOS/SALLJ Contribution to GCOS Action Plan over South America
# SALLJEX Archive Data Sets

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[www.joss.ucar.edu/salljex/dm/](www.joss.ucar.edu/salljex/dm/)
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SALLJEX
DATA WORKSHOP
10-12 Dec. 2003, Buenos Aires, Argentina

Workshop objectives:

a) To assess what progress have been made on SALLJEX objectives.

b) To strength and arrange collaborations among the partipants in SALLJEX.

c) To broaden participation in order to expand the analysis and modeling use of SALLJEX data by other scientists and their students

d) To determine follow-up SALLJEX activities

Workshop presentations in pdf format available at:
http://www.joss.ucar.edu/salljex/workshop/
**THEME I:**

**SALLJ MAIN FEATURES**

**SALLJ & NAL**

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<td>Climatology of the LLJ east of the Andes as derived from the NCEP reanalyses.</td>
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<td>estimates from operational analyses.</td>
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<td>Case studies using SALLJEX data and mesoscale modeling tools. SALLJ driving</td>
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<td>Atmospheric circulation pattern associated with the LLJ.</td>
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<td>Um Critério de Bonner Adaptado Para Identificar a Ocorrência de Jatos de Baixos Níveis no</td>
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<td>Lado Leste dos Andes na América do Sul.</td>
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<td>Study of diurnal wind cycles during SALLJEX. Revision of Bonner criterion over the SALLJEX</td>
<td>M. Nicolini, J. Paegle, P. Salio.</td>
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<td>region.</td>
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"South American Low-level jet diurnal cycle and three dimensional structure", Nicolini, Salio, Ulke, Marengo, Douglas, Paegle, Zipser
“Description of the Thermal Low characteristics using SALLJEX special observations”, Saulo, Ferreira, Mejia, Seluchi
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- **SALLJ and rainfall events (SESA, SACZ, Altiplano)**
- **MCS and SALLJ**
- **Cold surges**

#### SALLJ and intense precipitation events
- **V. Silva and E. H. Berbery**

#### SALLJ and extreme precipitation events in Southern Brazil
- **M. Gan, D. Severo, P. Satyamurty and collaborators.**

#### Relationship between the occurrence of SALLJ and daily precipitation and temperature extreme events
- **O. Penalba, M. Rusticucci, L. de Benedictis.**

#### Extreme precipitation events over Southern Brazil associated to SALLJ
- **T. Ambrizzi** and collaborators.

#### Intraseasonal oscillation influence on SALLJ and related rainfall pattern
- **C. Vera, C. Saulo, B. Liebmann, C. Campetella, G. Kiladis, J. N. Paegle.**

#### Diurnal cycle of MCSs over northeast Argentina and possible relationship to the diurnal cycle of the SALLJ
- **Salio, Zipser and Nicolini**

#### The relationship between extreme South American Low-Level Jet events with the formation and maintenance of mesoscale convective systems
- **Zipser, Salio and Nicolini**

#### Case study of the large and intense MCS of 22-23 January, including time history of satellite IR high resolution data, surface meteorological and rainfall data, and aircraft in situ and Doppler radar data
- **Zipser, Salio, Nicolini, M. Douglas, B. Liebmann, C. Liu.**

#### Feedback between convection and low level jet strength
- **J. Ruiz and C. Saulo.**

#### Structure of cold frontal surges near the eastern slopes of the Andes
- **J. Marengo, R. Garreaud, T. Ambrizzi.**

#### Relationship between the low-level circulation over the Bolivian low-lands and the Altiplano rainfall
- **R. Garreaud, P. Aceituno.**

#### Mesoscale rainfall variability over the Altiplano and the Titicaca Lake

#### Statistical study of the convective intensity of MCSs over the SALLJEX area, combining "snapshots" from the Tropical Rain Measuring Mission with the more comprehensive IR database
- **Zipser, Salio, Nicolini, C. Liu.**
“Mesoscale Convective Systems activity during SALLJEX and the relationship with SALLJ events”, Zipser, Salio, Nicolini
“Variability of Moisture and Convection over the Central Andes during SALLJEX”, Falvey, Garreaud

![Diagram showing variability of moisture and convection over the Central Andes during SALLJEX](image.png)
“Intraseasonal variability of the South American Low-Level Jet during SALLJEX”, Vera, N.-Paegle, Liebmann, Saulo
SALLJEX current investigations

**THEME III: SALLJ modeling studies**

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**ARGENTINA**
- BRAZIL
- CHILE
- PARAGUAY
- PERU
- URUGUAY
- USA

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**Studies of forecast sensitivity to initial state changes using SALLJEX observations. J. P. de P., C. Sauro, E. Byeale, and J. H. P. de P.**

**Validation of forecast models using SALLJEX observations. J. P. de P., C. Sauro,** and others.**

**Validation of two different versions of the ETA/CPTEC Model performance during SALLJEX. M. C. Sahhata, G. More, C. M. Chou, L. G. Gove, J. E. Turner.**

**Model evaluation: the role of land surface boundary conditions. E. Collar and E. H. Burby.**

**Seasonal simulations: role of initial and boundary conditions. M. Pena and E. H. Burby.**

**Analysis of different case studies considering the period of the experiment and different model results. I. Cervantes, P. Silva Dias, M. A. Silva Dias, C. Sauro, M. Nicolini, J. M. Mergo.**

**Analysis of the LLJ structure through regional climate simulations with high space-temporal resolution. T. Ando and collaborators.**

**The impact of new solar radiation parameterization on the NCEP ETA model simulation of the summer climate over South America. T. A. M. Pena, J. P. de P. Fernandes, L. A. Mariano, S. S. Sahhata.**

**The LLJ in South America: Validation of the ETA/CPTEC during SALLJEX. G. Vera, C. Nohra, C. Hoover.**

**Simulation of the South American Monsoon System for future climates derived from the HadCM3 and HadAM3 models. *I. Marango, J. M. Mergo, E. Betts, P. Cox.**

**Use of rainfall estimates from NOAA-P3 radar data for validation of rainfall numerical simulations. G. Raga and collaborators.**

**Local forecast of convection over northern Argentina using SALLJEX upper air data. M. Nicolini and C. Sauro.**

**Modeling experiments, using the FSAS assimilation scheme in the AGCM CPTEC/COLA, and RPSAS in the regional model. I. Cervantes, J. M. Mergo, D. Herbst.**

**SALLJEX data assimilation experiments using Global and regional CPTEC Models. D. Herbst, C. C. Chou, J. Ando.**

**Evaluation of the impact of enhanced NCEP analysis with SALLJEX data (through downscaling) regional short range forecast using RAMS. M. Nicolini, P. Silva Dias, M. A. Silva Dias, Y. Garcia Sabor.**

**Assimilation experiments with and without SALLJEX data, combined with simple breeding experiments in order to evaluate bred vectors shape. E. Kabe and Juan Pous.**

**Impact of the Finite Volume Numerical Scheme in RAMS Simulations of the Andes LLJ. P. Silva Dias, D. Sorres Moreira, S. Barros, P. Rojas.**

**Improvements in the RAMS data assimilation system. P. Silva Dias, A. Gand, D. Sorres Moreira, S. Freitas.**

**Combined use of MM5 and ARPS models for an improvement of the convection forcing in the SALLJ region. G. Raga, D. Rojo, M. Torres Erizuela, M. Nicolini.**

**Modeling experiments using different convection and radiation parameterization schemes, during the period of the experiment. I. Cervantes, S. Niño, J. C. Chacón.**
### Theme IV: Other SALLJ related studies

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<td>Using ECMWF and NASA scatterometer ocean surface to study the process that control seasonal, interannual and intraseasonal variations of SALLJs.</td>
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<td>Basic water and momentum balances for the SALLJ region with and without SALLJEX data.</td>
<td>E. Kalnay and collaborators.</td>
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**Locations:**
- ARGENTINA
- BRAZIL
- CHILE
- PARAGUAY
- PERU
- URUGUAY
- USA
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Call for Contributions

We would like to invite the CLIVAR community to submit papers to CLIVAR Exchanges for the next issue. The overarching topic will be "***". The deadline for this issue will be announced through the CLIVAR webpage (see below).

Guidelines for the submission of papers for CLIVAR Exchanges can be found under: http://www.clivar.org/publications/exchanges/guideline.htm

Editorial: 
Introduction to the South American Low Level Jet Experiment (SALLJEX)
The South American Low Level Jet Experiment (SALLJEX) Multinational Logistics, Coordination and the Implementation of the Daily Operations
CLIVAR Calendar
South American Low Level Jet Diurnal Cycle and Three Dimensional Structure
Description of the Thermal Low Characteristics using SALLJEX Special Observations
Variability of Moisture and Convection over the Central Andes during SALLJEX
Mesoscale Convective Systems Activity during SALLJEX and the relationship with SALLJ Events
Modeling Studies Related to SALLJEX
Data Assimilation Study using SALLJEX Data
Low-Frequency Variability for the SALLJ
SALLJEX Data Management Activities
Daily Rainfall Data over Argentina and Uruguay during SALLJEX

Influence of Cross-Andes Flow on the SALLJ and Application of Real-Time Scatterometer Observations to Forecasting the SALLJs
Interannual and diurnal variability of January precipitation over subtropical South America simulated by a regional climate model

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SALLJ Post-Field Activities

- March 2003: Data collection and quality control
- March 2003: Database construction
- March 2003: SALLJEX related research starts
- 23-26 April 2003: SALLJ/SWG Meeting in VPM6
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VAMOS Contribution to GCOS
Project Brief: Enhancement of the GUAN network in Central South America
How Amazonia functions currently as a regional entity with respect to the natural cycles of water, energy, carbon, nutrient and trace-gases?

How will changes in land use and climate affect the biological, chemical and physical functioning of Amazonia, including its sustainability and influence on global climate?
LBA in numbers

- 130 studies (30% completed) covering the 7 LBA themes
- Over 150 institutions from all Amazonian countries, US and EU
- Over 1200 participants (about 500 students; 160 PhD students)
- To date over 400 peer-reviewed articles in scientific literature
Vegetation Types in Brazilian Amazonia

Data source: Radam
Water Budget – Convection Modes -

- Role of Intraseasonal Oscillation in organizing convection in Amazon/Central Brazil;
- Moisture flux from North Atlantic
- Moisture exchange with Plata Basin
- Heat source: different vertical profiles – implication on remote response
Realistic deforestation patterns: increase or decrease of precipitation?
Cronograma do LBA
Campanhas de medidas intensivas e monitoramento contínuo


- fase preparatória
  infraestrutura e instalação
- monitoramento ecológico
- física do clima e hidrologia
- química atmosférica
- compilação da base de dados
- modelagem diagnóstica e preditiva

WETAMC - Claire 2 - DRYTOWET
Claire 1 - CIRSAN - BARCA

Synthesis and Integration
2004-2005

The Large Scale Biosphere-Atmosphere Experiment in Amazonia
ABOUT MESA FUTURE DIRECTIONS

(From VPM6)

• MESA Tier 2 goal: To integrate the objectives of the different programs in South America (SALLJEX, PLATIN, LBA) in an unified program.

  ➢ MESA & CSEs over South America
  ➢ MESA Organization

Main questions: How is the response of circulation and precipitation over South America to slowly boundary conditions (SSTs and soil moisture)? Which is its impact on the water cycle?

  ➢ Low frequency modulation of the SAMS elements:
    • SA see-saw pattern.
    • ITCZ-SACZ interaction
    • Intraseasonal variability; MJO and other IOs
    • Interannual variability; relative roles of internal vs forced variability. Land surface forcing. Role of remote and local SST.

MESA Tier 2 components:

  ➢ Diagnostic and modeling studies
  ➢ Enhance monitoring and/or Field Campaigns