

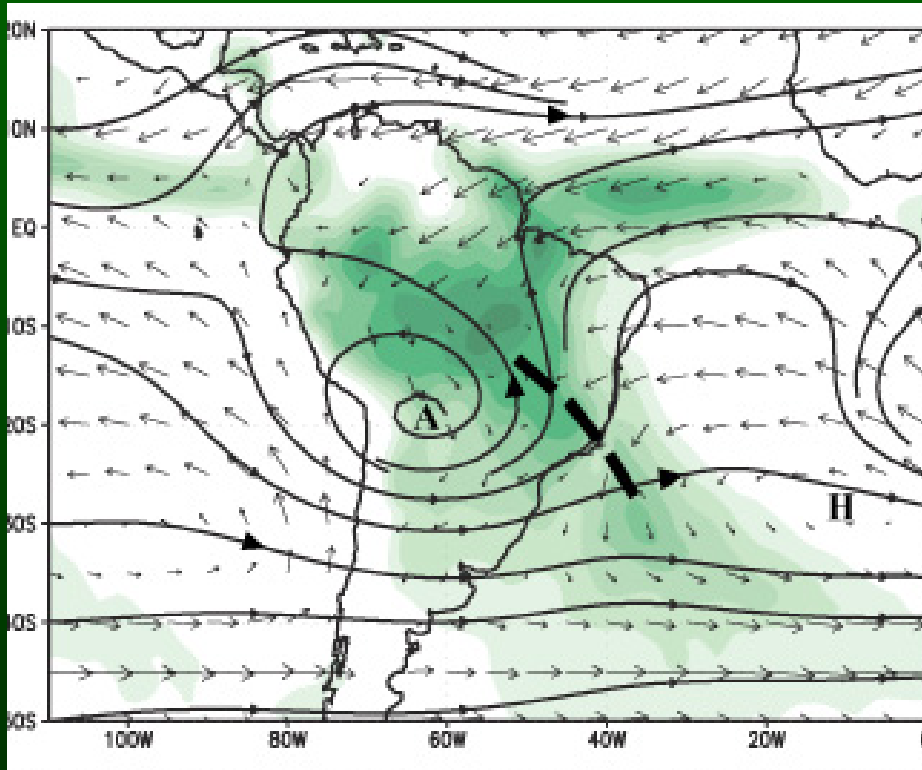
MESA
Monsoon Experiment
over South America

Carolina Vera

CIMA/University of Buenos Aires

Buenos Aires, Argentina

MESA OBJECTIVES

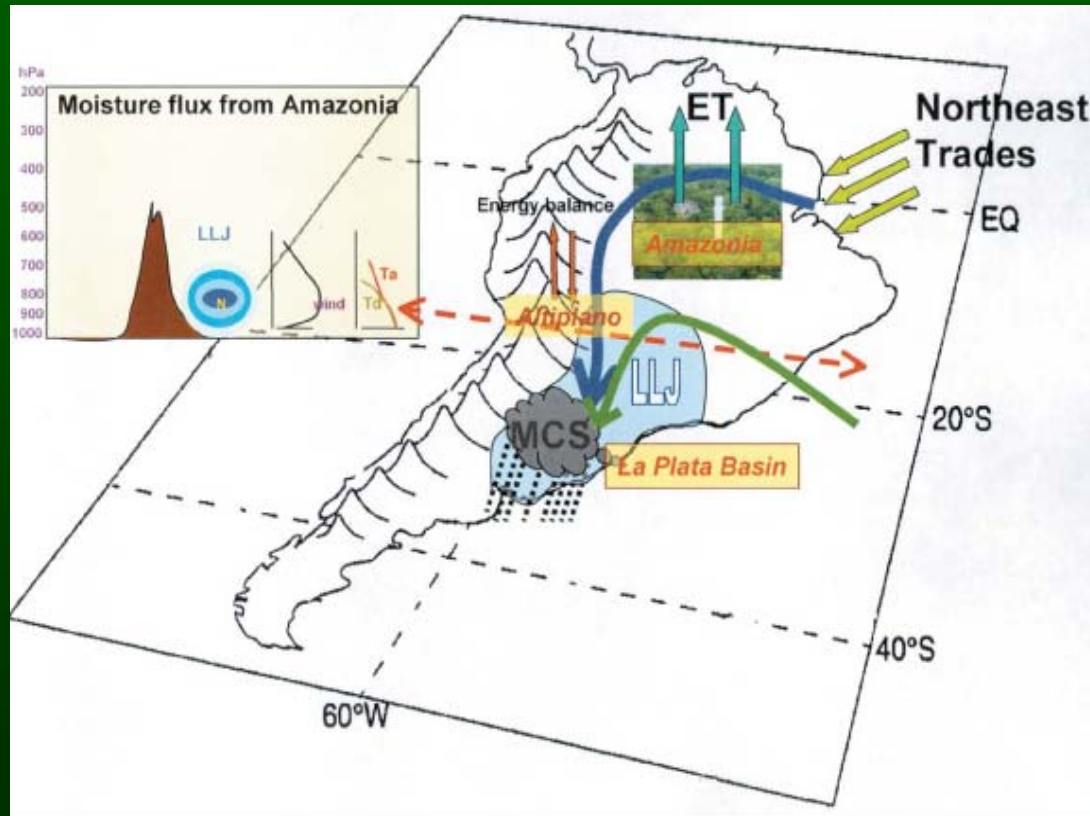


- 1) a better understanding of the South American monsoon system and its variability,
- 2) a better understanding of the role of that system in the global water cycle
- 3) improved observational data sets, and
- 4) improved simulation and monthly-to-seasonal prediction of the monsoon and regional water 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

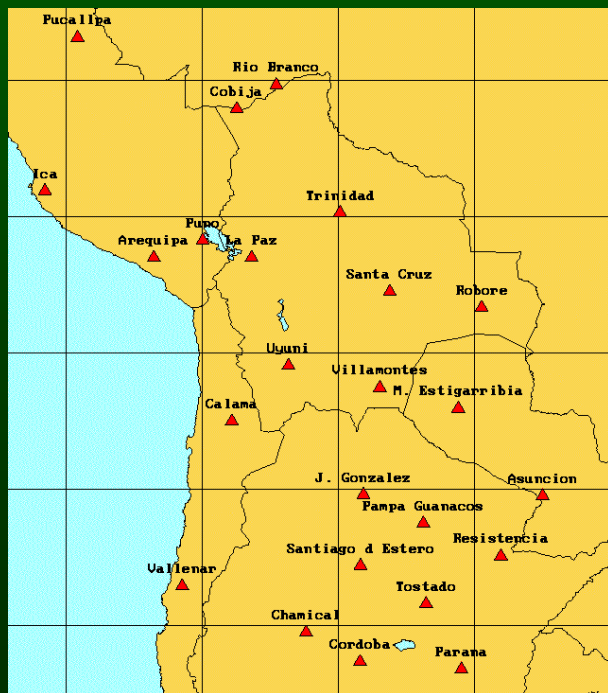


SALLJEX Upper-air network

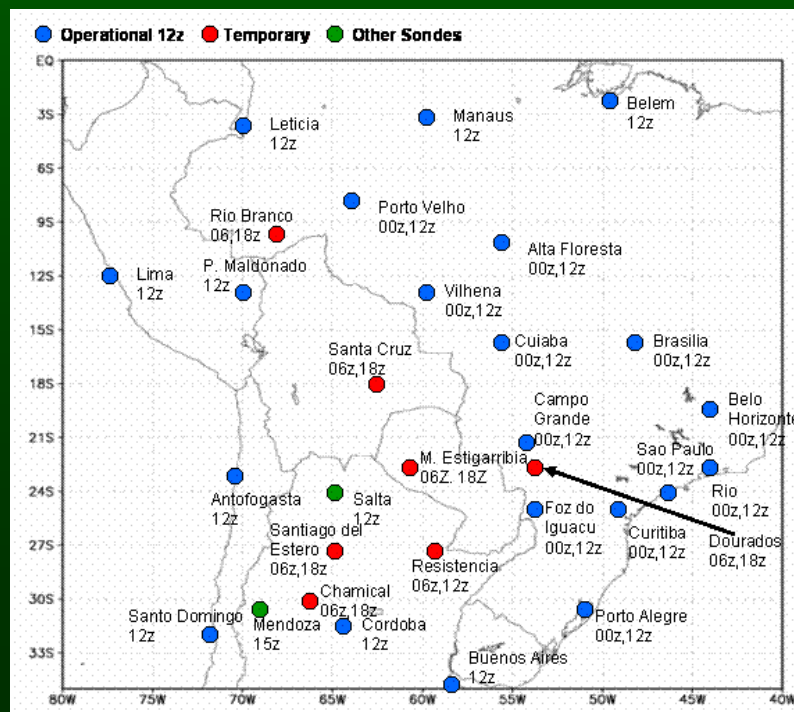


- Quantification of the SALLJ intensity on a daily basis.
- Diurnal variations of the SALLJ
- Structure of the Chaco heat low

PIBAL Network



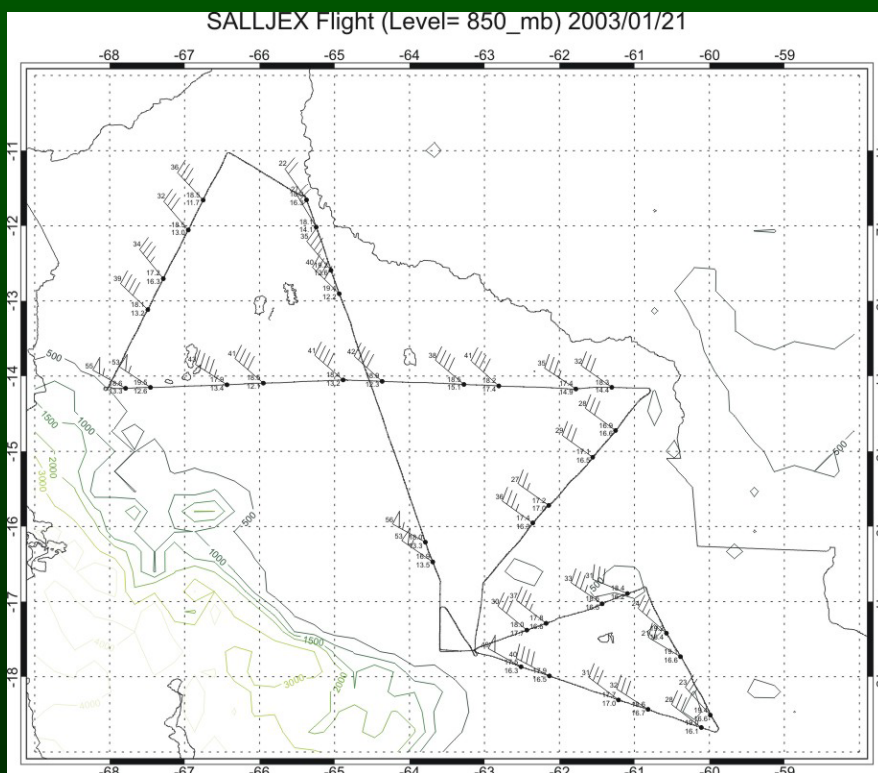
Radiosonde Network



NOAA/P3 Missions in SALLJEX



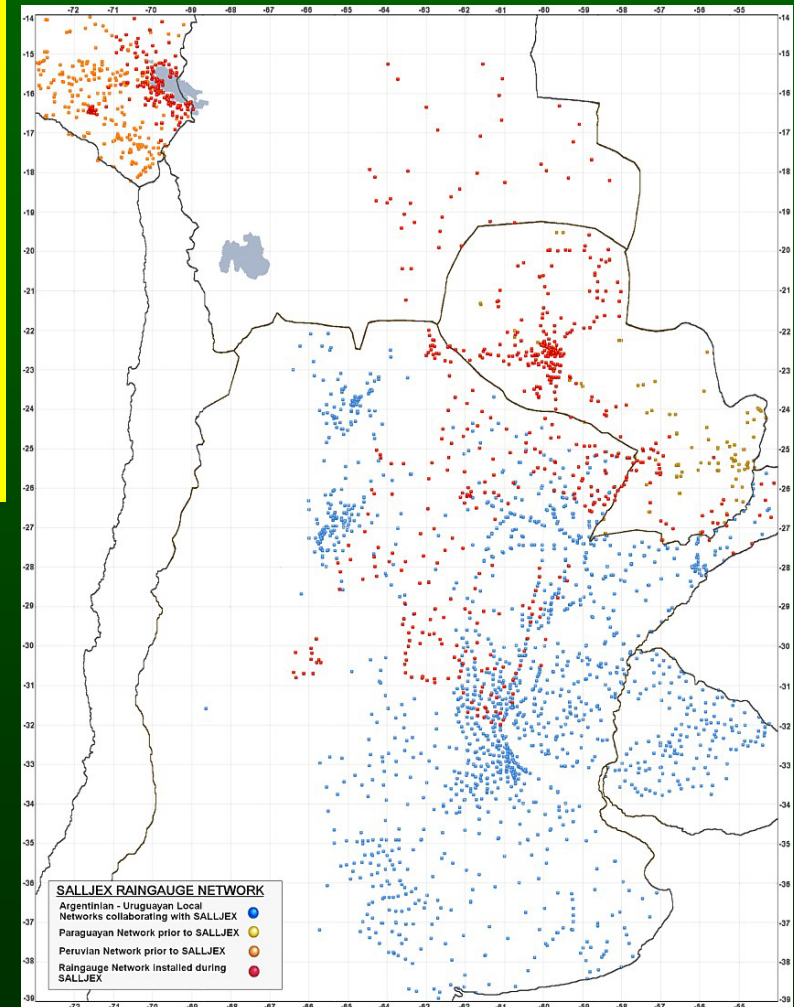
- Detailed description of the 3-dimensional structure of the SALLJ
- The relationship between MCS and the SALLJ
- Structure of cold frontal surges near the eastern slopes of the Andes
- Description of mesoscale winds and moisture variability over the Altiplano
- Description of the heat low over the Chaco and NW Argentina



SALLJEX daily precipitation network



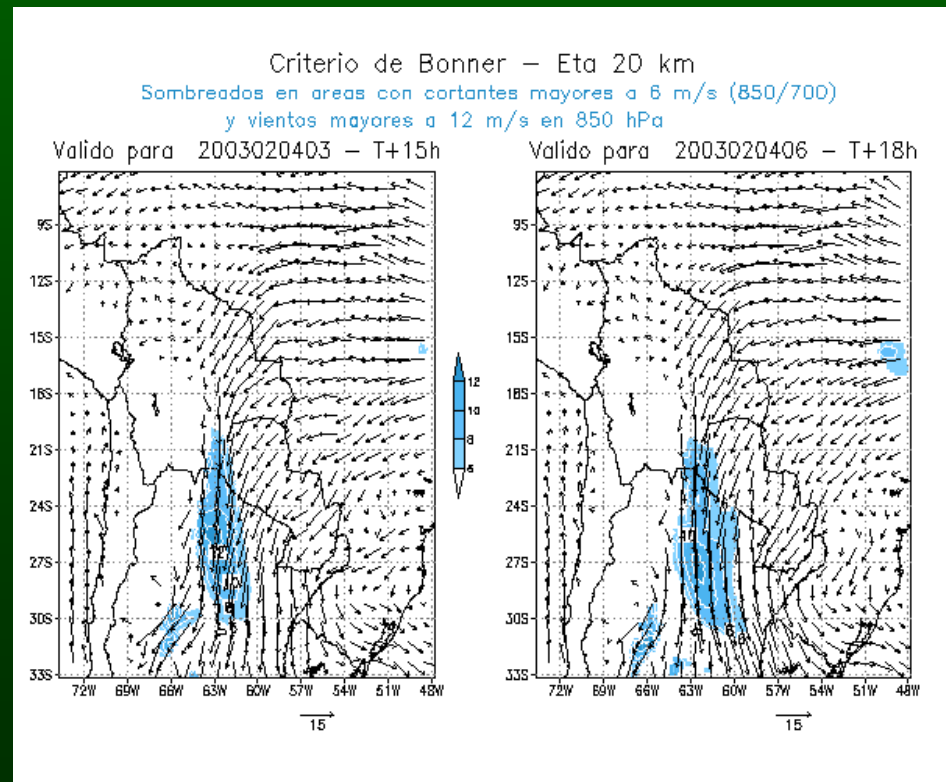
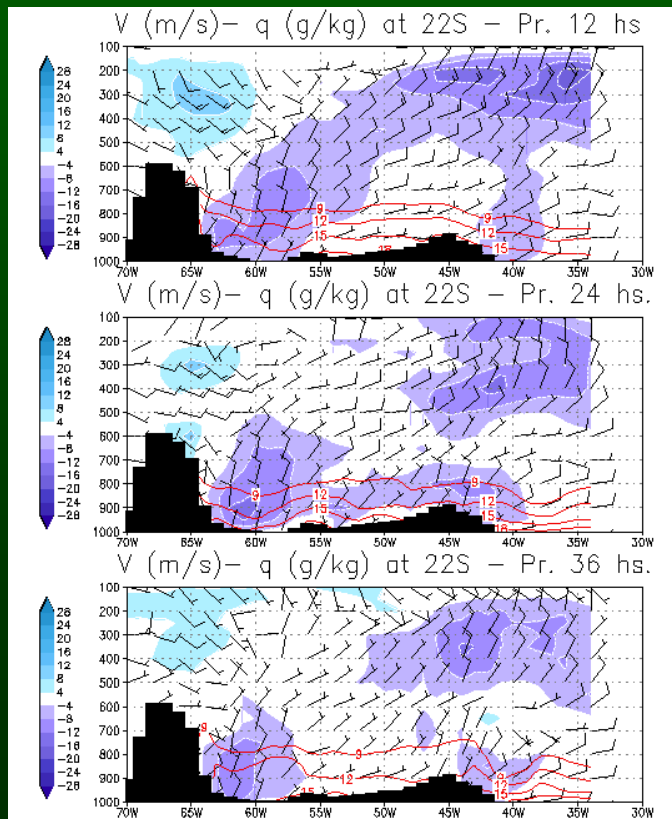
- Determination of wet and dry periods during the experiment and their relationship with SALLJ events
- Providing ground truth estimates for comparison with a hierarchy of numerical simulations of rainfall in the region.
- Determining the accuracy of satellite-rainfall estimates over the region.



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**
- **23-26 April 2003: SALLJ/SWG Meeting in VPM6.**
- **May 2003-: SALLJEX numerical experiments**
- **10-12 Dec 2003: SALLJEX Data Workshop. Buenos Aires, Argentina.**
- **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 Master Dataset List at JOSS



SALLJEX Archive Data Sets



DATA CATEGORIES

[Aircraft Data](#)

[Data Assimilation](#)

[GTS Data](#)

[Land Use](#)

[Model Output](#)

[Precipitation Data](#)

[Satellite Data](#)

[Surface Based Data](#)

[Upper Air Data](#)

[Back to JOSS SALLJEX](#)

[Data Management](#)

Email comments & questions
to the SALLJEX
webmaster@ucar.edu

Data Set Name (Responsible group/PIs shown in parentheses)	Date Posted	Documentation
Aircraft Data		
Aircraft P-3 General Information, Mission Summaries	2003-06-19	
Aircraft P-3 Meteorological State and Navigation Parameters - slow data [NetCDF] (NOAA/AOC)	2003-08-04	
Aircraft P-3 Meteorology Doppler X-Band (Tail) Radar Radial Reflectivity Data (JOSS)	2003-06-24	
Aircraft P-3 Meteorology Doppler X-Band (Tail) Radar Radial Velocity Data (JOSS)	2003-06-24	
Aircraft P-3 Meteorology Lower Fuselage C-Band Radar Data (JOSS)	2003-06-24	
Aircraft P-3 Meteorology Lower Fuselage C-Band Radar Imagery (JOSS)	2003-06-19	
Aircraft P-3 Meteorology Navigation and State Parameters- netCDF format (JOSS)	2003-08-05	
Aircraft P-3 Meteorology Navigation and State Parameters- Standard Tape Format (NOAA/AOC)	2003-08-05	

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/>

SALLJEX current investigations



THEME I:

SALLJ MAIN FEATURES

SALLJ & NAL

ARGENTINA

BRAZIL

CHILE

PARAGUAY

PERU

URUGUAY

USA

Climatology of the LLJ east of the Andes as derived from the NCEP reanalyses. [Marengo, J. W.](#), [Soares, C.](#), [Saulo, M.](#), [Nicolini.](#)

Structure of the LLJ and its synoptic variability as described by both SALLJEX data and estimates from operational analyses. [M. Douglas](#), [J. M. Galvez](#), [J. F. Mejia](#), [M. Nicolini](#), [E. Zipser](#), [C. Saulo](#) and [P. Salio](#)

Case studies using SALLJEX data and mesoscale modeling tools. SALLJ driving mechanisms. Role of SALLJ on transport processes. [G. Ulke](#), [M. Nicolini](#), [Y. Garcia Skabar](#), [P. Silva Dias](#), [M. Douglas](#) and [J. F. Mejia](#).

Studies on LLJ events during the LBA DRY to WET and SALLJEX Brasil. [J. Marengo](#) and collaborators.

Observational and numerical case studies for different interests. [M. Nicolini](#), [P. Salio](#), [Y. Garcia Skabar](#), [G. Ulke](#), [C. Saulo](#), [L. Ferreira](#), [J. Ruiz](#)

Structure of the LLJ using aircraft data. [A. Santos](#) and [M. Gan](#)

Atmospheric circulation pattern associated with the LLJ. [A. Santos](#), [M. Gan](#) and [M. Moscati](#).

Thermodynamic structure of the LLJ. [N. Calbete](#), [S. H. Ferreira](#) and collaborators.

Fontogenesis associated with the LLJ. [P. Satyamurty](#) and [L. Mattos](#).

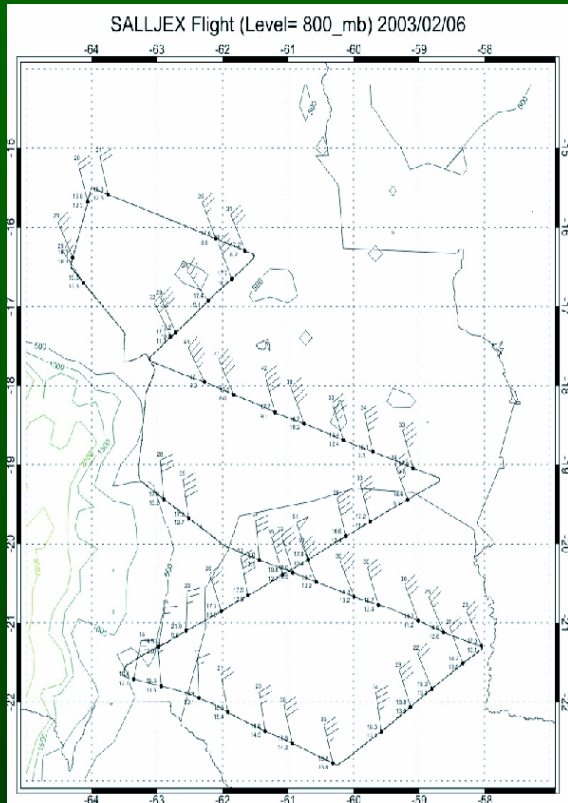
Análise de Circulação e Transporte de Umidade Durante o SALLJEX e LBA-RACCI utilizando observações, Modelagem Regional, Reanalises do NCEP e ERA40. [W. Soares](#), [J. Marengo](#)

Um Critério de Bonner Adaptado Para Identificar a Ocorrência de Jatos de Baixos Níveis no Lado Leste dos Andes na América do Sul. [W. Soares](#), [J. Marengo](#).

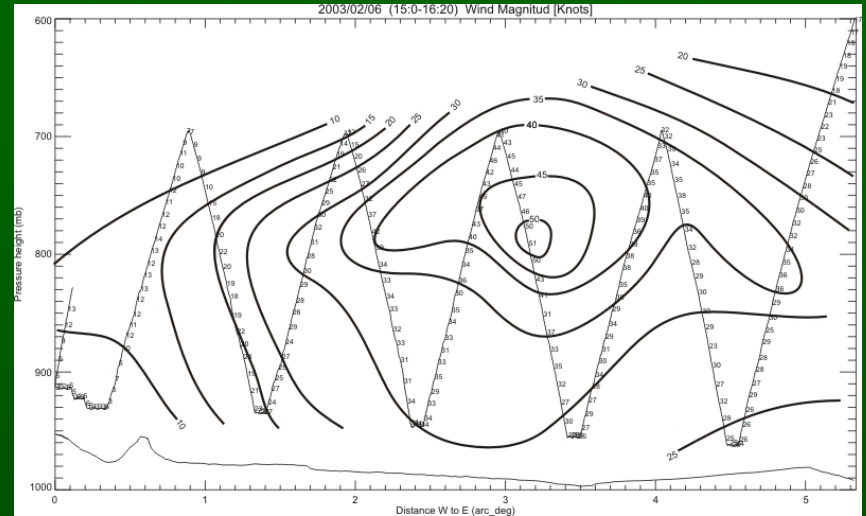
Study of diurnal wind cycles during SALLJEX. Revision of Bonner criterion over the SALLJEX region. [M. Nicolini](#), [J. Paegle](#), [P. Salio](#).

Analysis of the Chaco heat low event between 30 Jan and 2 Feb. [L. Ferreira](#), [C. Saulo](#), [M. Seluchi](#), and [J. Mejia](#).

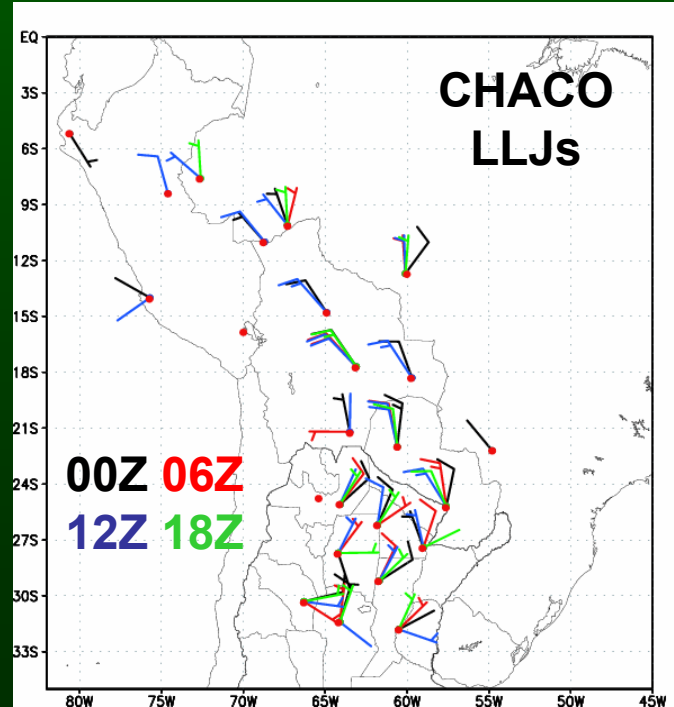
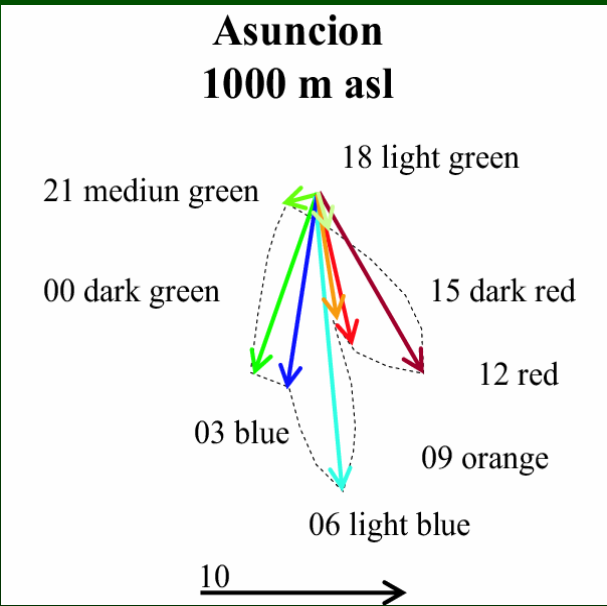
“South American Low-level jet diurnal cycle and three dimensional structure”, Nicolini, Salio, Ulke, Marengo, Douglas, Paegle, Zipser



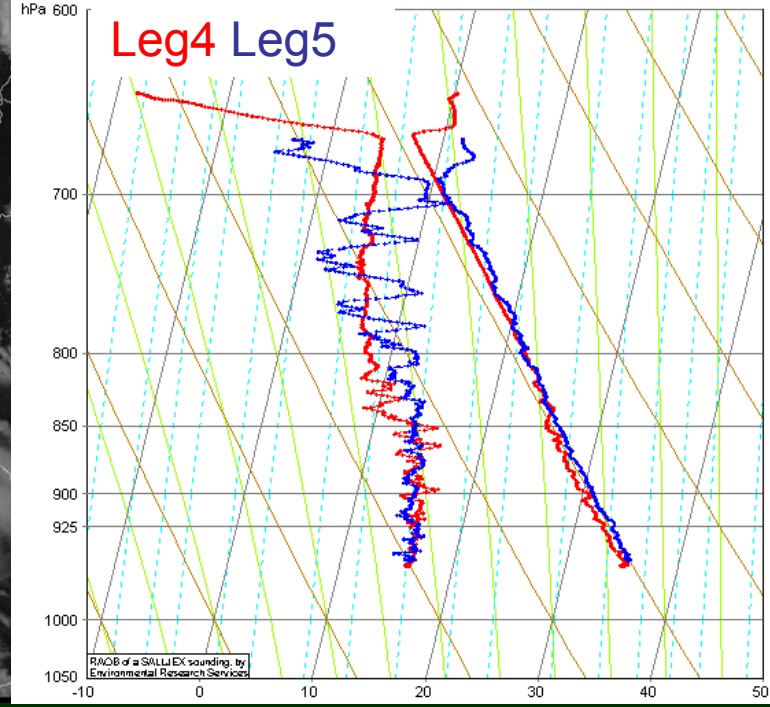
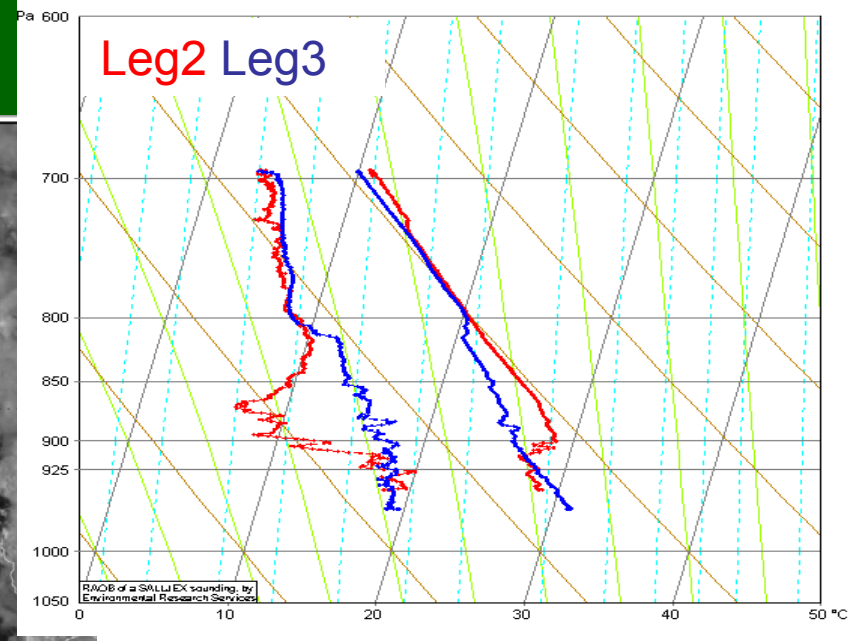
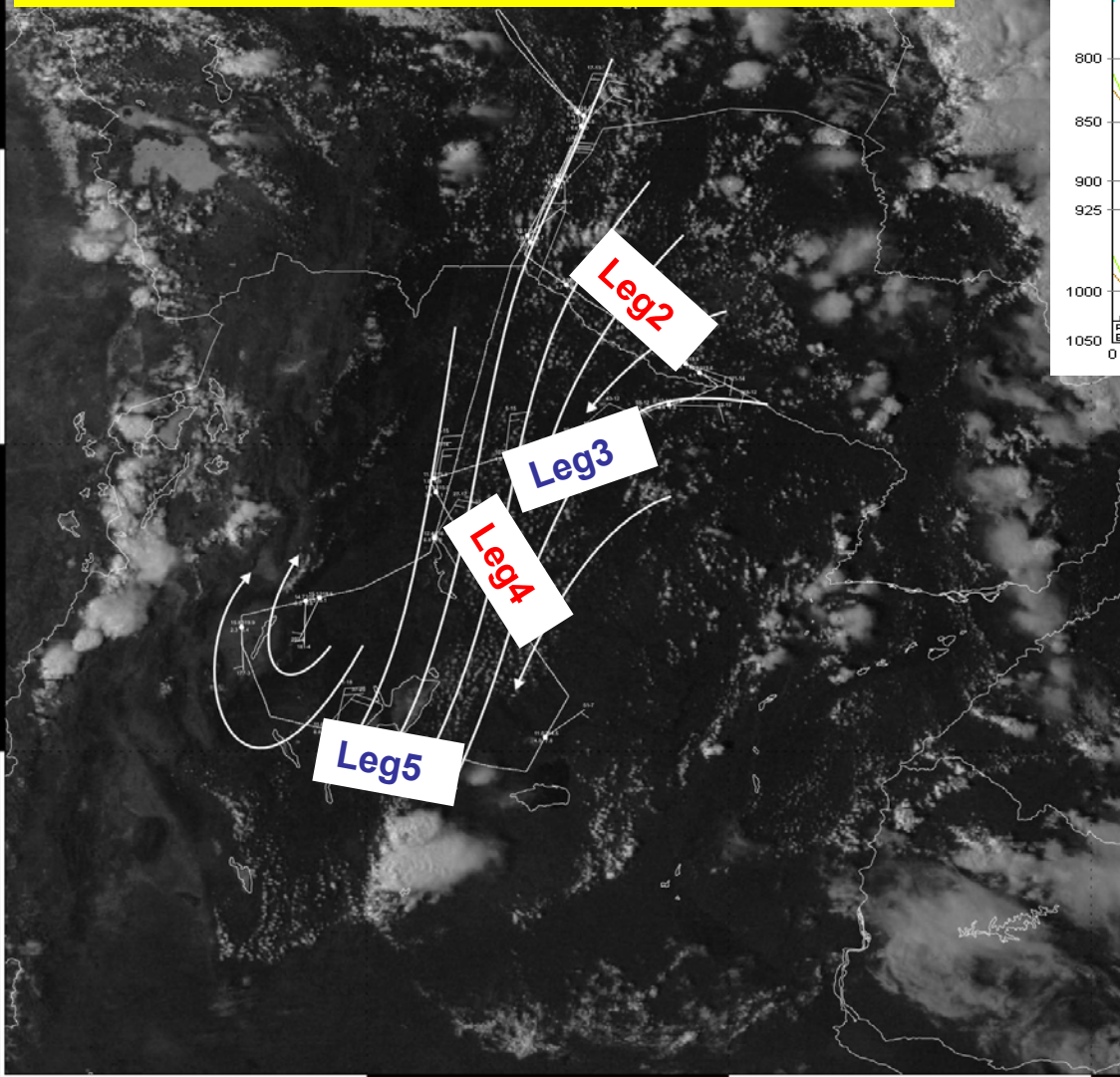
**SALLJ
horizontal and
structure**



**SALLJ
diurnal cycle**



“Description of the Thermal Low characteristics using SALLJEX special observations”, Saulo, Ferreira, Mejia, Seluchi



SALLJEX current investigations



**THEME II:
SALLJ and
rainfall events
(SESA, SACZ,
Altiplano)**

**MCS and
SALLJ**

Cold surges

**ARGENTINA
BRAZIL
CHILE
PARAGUAY
PERU
URUGUAY
USA**

LLJs and intense precipitation events. [V. Silva](#) and [E. H. Berbery](#).

LLJs 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](#).

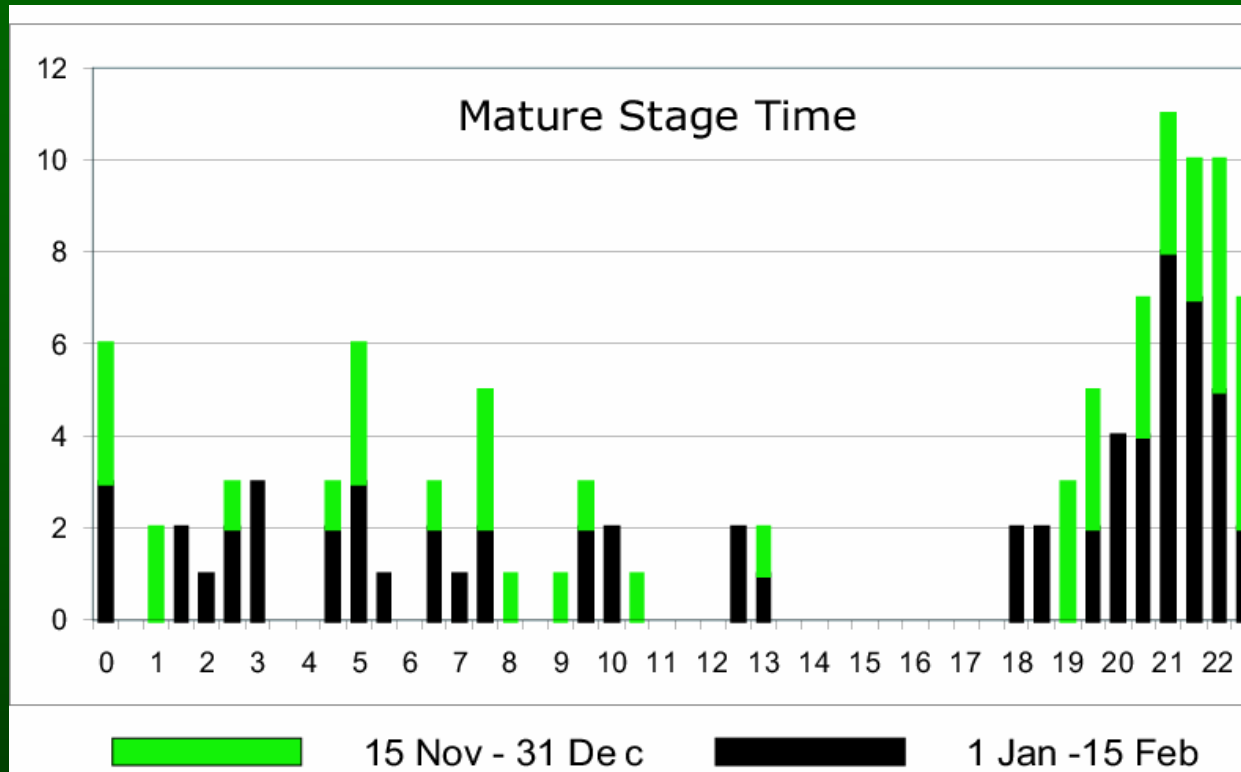
Structure of cold frontal surges near the eastern slopes of the Andes. [J Marengo](#), [R. Garreaud](#), [T. Amrbizzi](#).

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. [M. Douglas](#), [J. M. Galvez](#), [J. F. Mejia](#), [R. Orozco](#), [C. Reyes](#).

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](#).

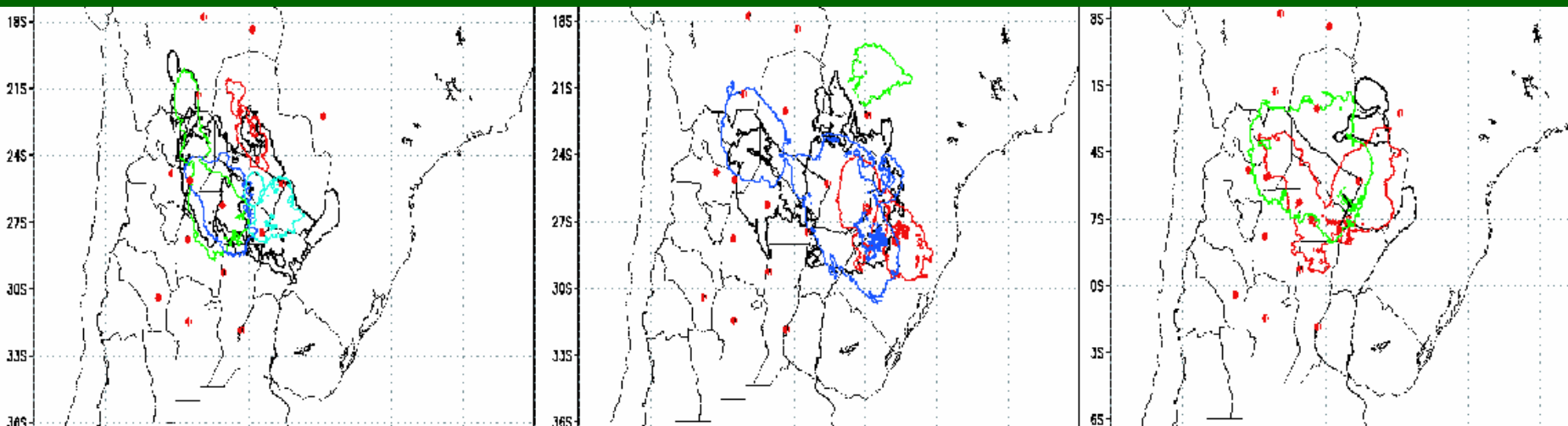
“Mesoscale Convective Systems activity during SALLJEX and the relationship with SALLJ events”, Zipser, Salio, Nicolini



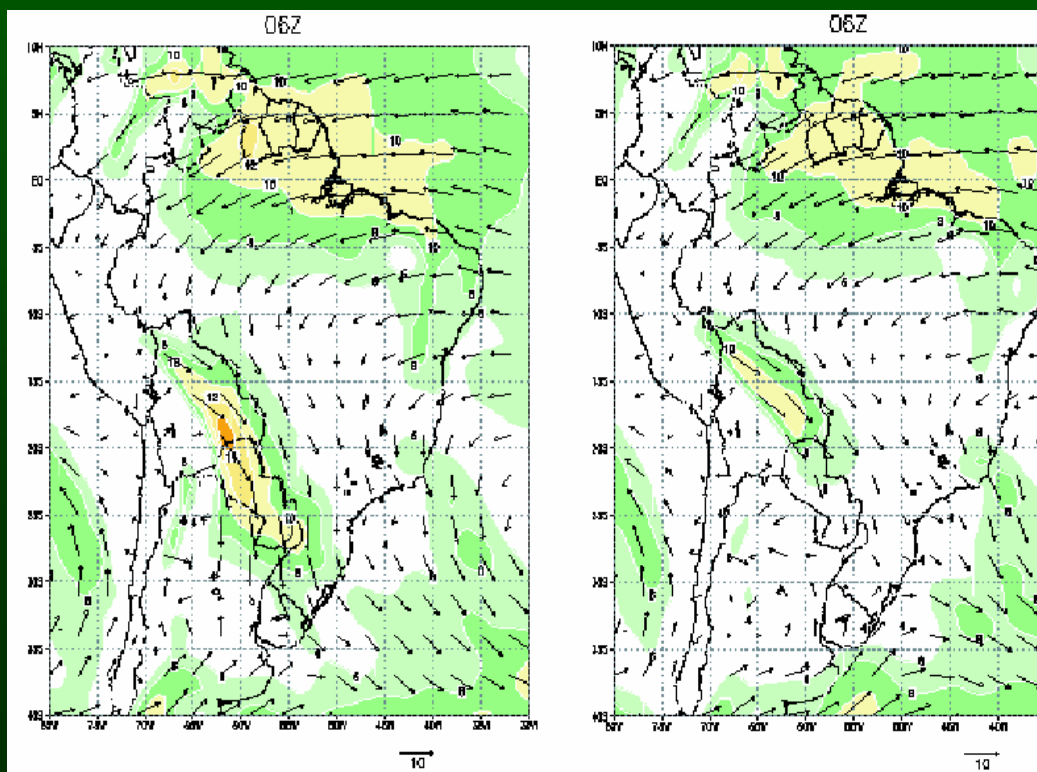
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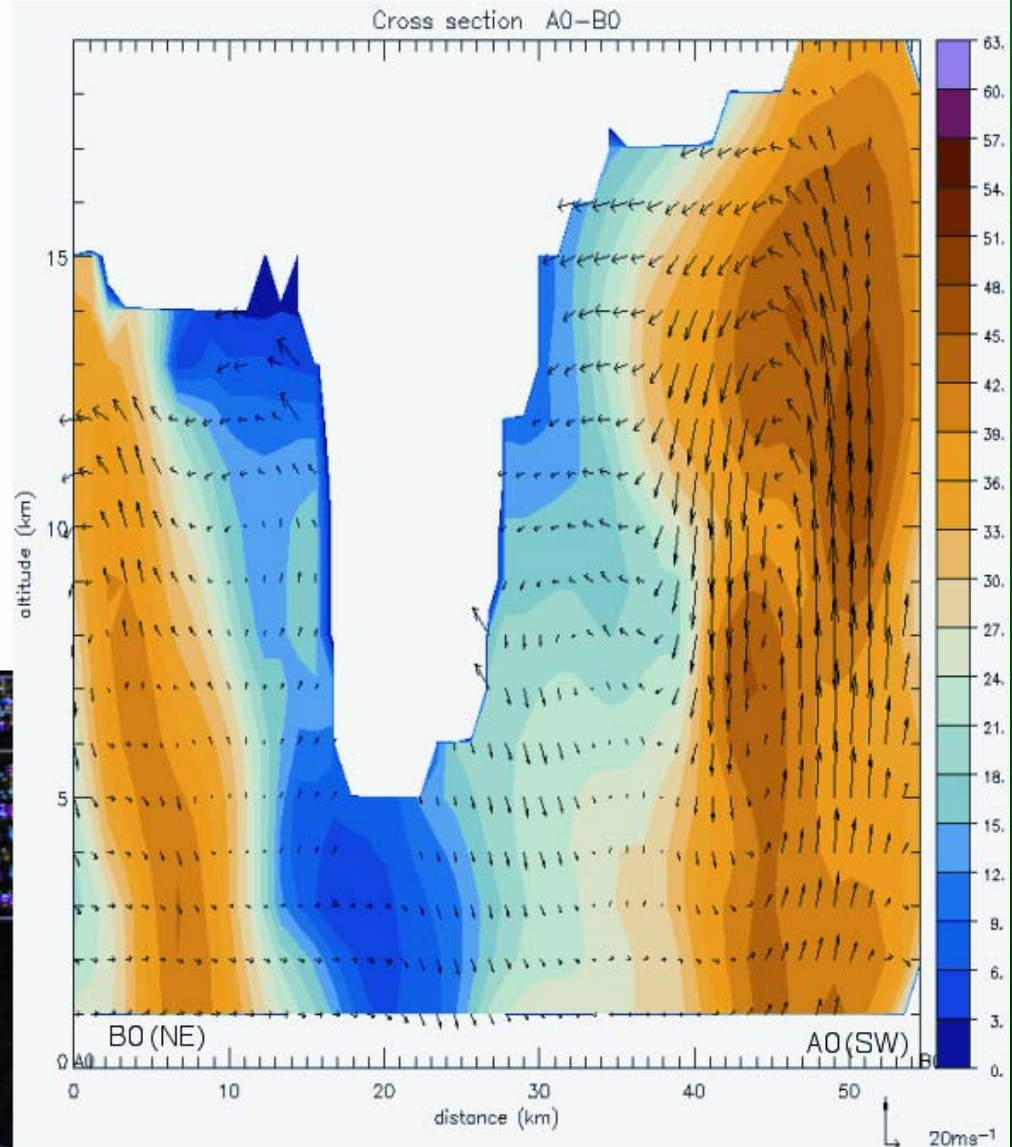
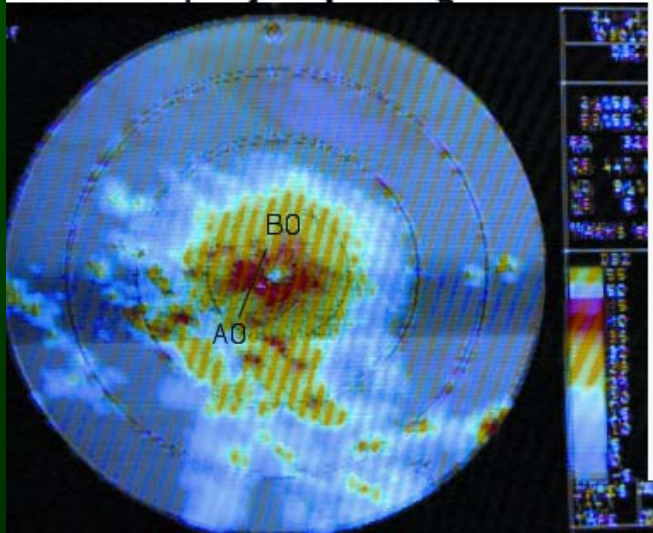
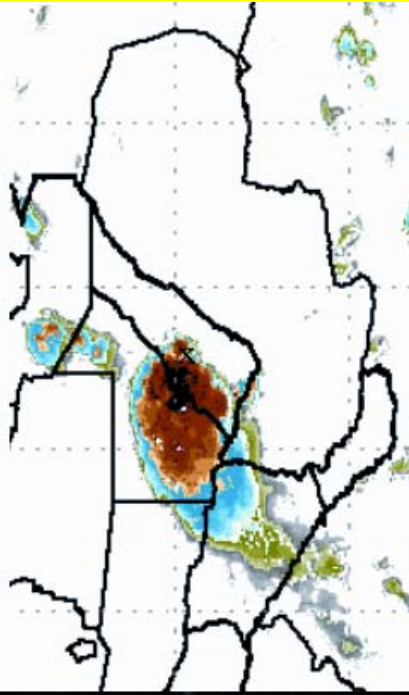


Day -1 to
MCS Day

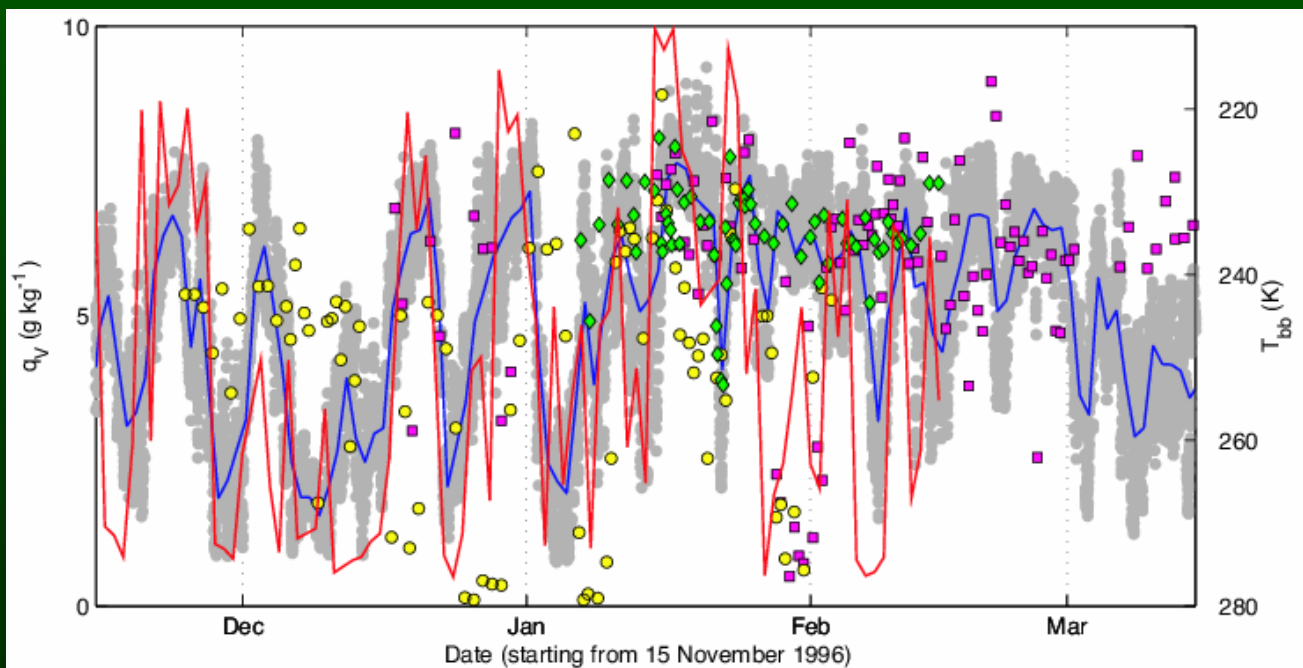
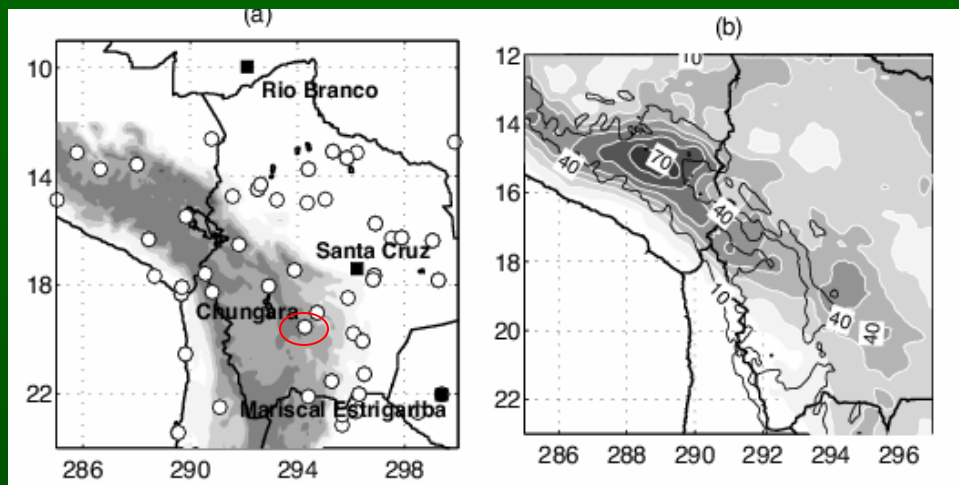


MCS Day

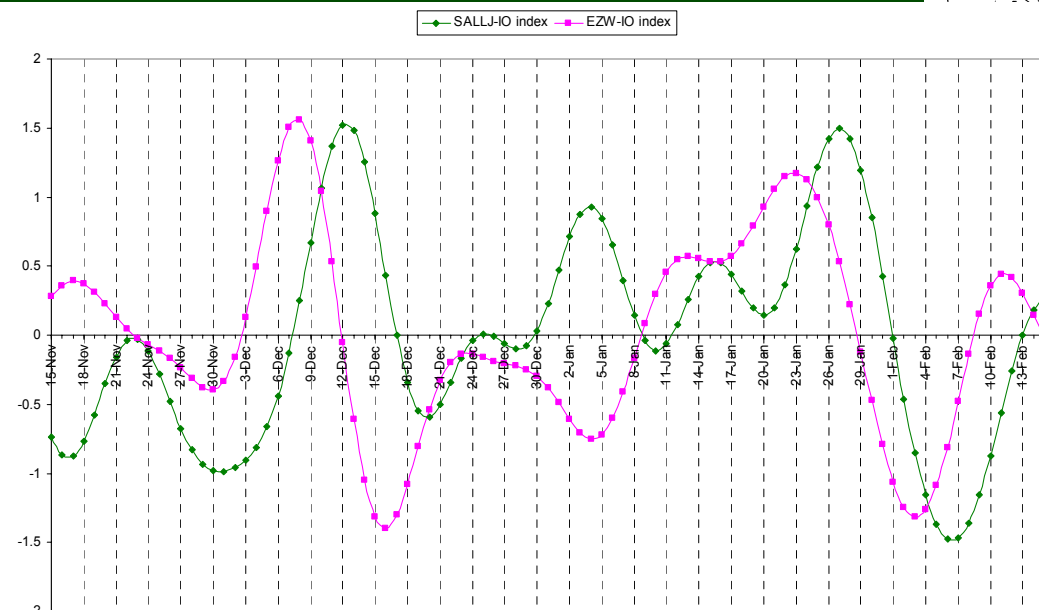
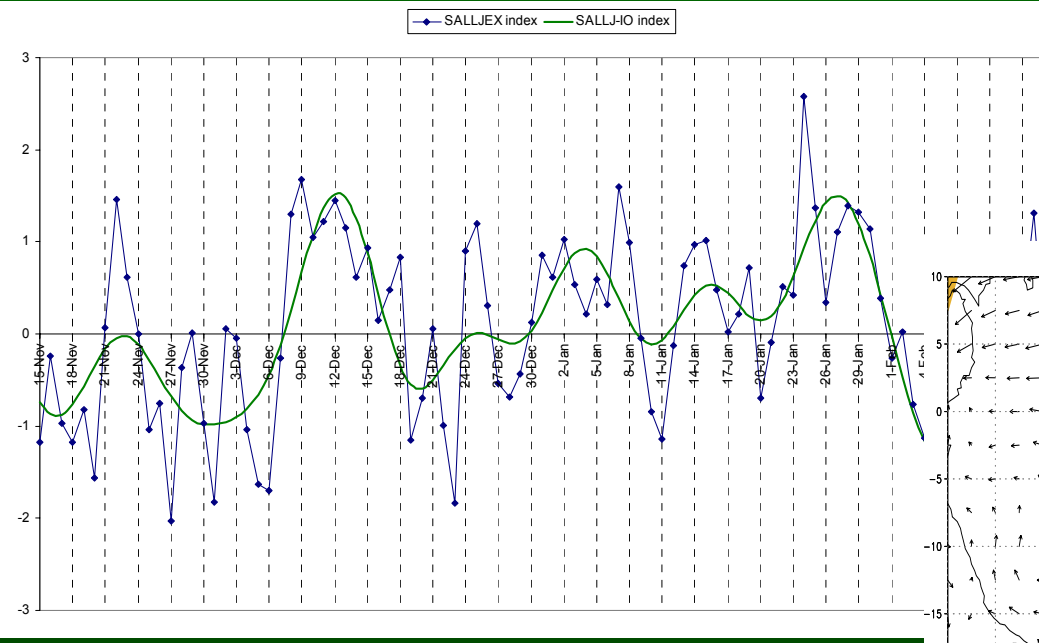
“Mesoscale Convective Systems activity during SALLJEX and the relationship with SALLJ events”, Zipser, Salio, Nicolini



“Variability of Moisture and Convection over the Central Andes during SALLJEX”, Falvey, Garreaud

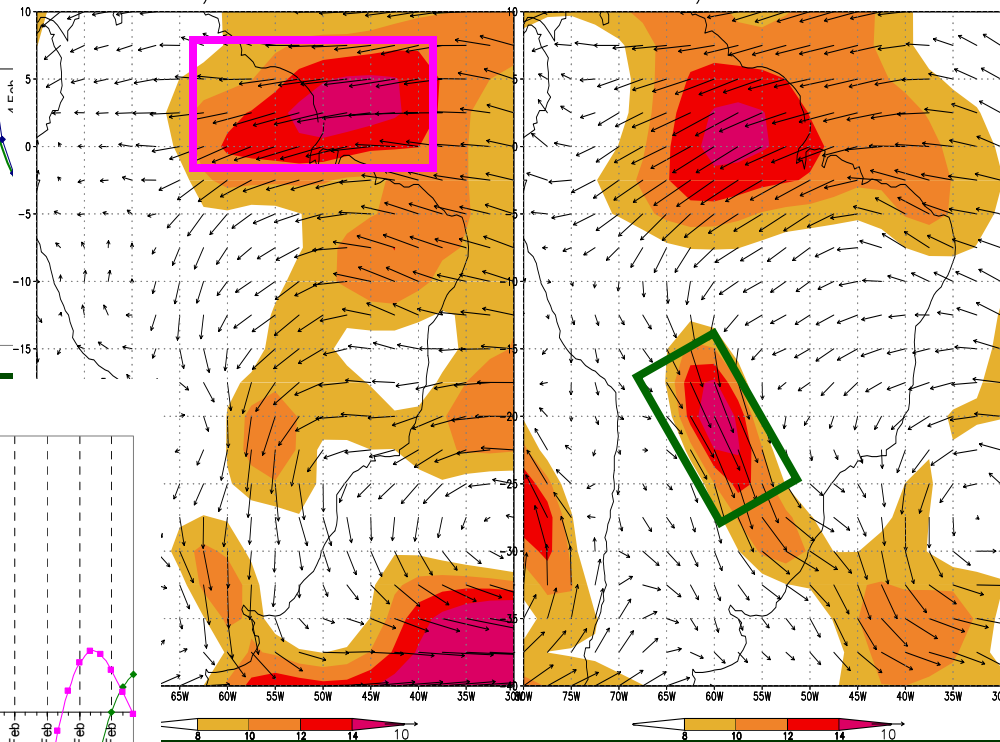


“Intraseasonal variability of the South American Low-Level Jet during SALLJEX”, Vera, N.-Paegle, Liebmann, Saulo



c) 02 FEB 2003

d) 06 FEB 2003



SALLJEX current investigations



THEME III: SALLJ modeling studies

ARGENTINA
BRAZIL
CHILE
PARAGUAY
PERU
URUGUAY
USA

Studies of forecast sensitivity to initial state changes using SALLJEX observations. J. Paegle , C. Saulo , L. Byerle , and J. N. Paegle .
Validation of forecast models using SALLJEX observations. J. Paegle , C. Saulo , and others.
Validation of two different versions of the ETA/CPTEC Model performance during SALLJEX. M. Sebuchi , G. Meira , Chou , J. Gomes , J. Eustamante .
Model evaluation: the role of land surface boundary conditions. E. Collini and E. H. Berbery .
Seasonal simulations: role of initial and ocean boundary conditions. M. Peña and E. H. Berbery .
Analysis of different case studies considering the period of the experiment and different model results. I. Cavalcanti , P. Silva Dias , M. A. Silva Dias , C. Saulo , M. Nicolini , J. Marengo .
Analysis of the LLJ structure through regional climate simulations with high space-temporal resolution. T. Ambrizzi and collaborators.
The impact of new solar radiation parameterization on the NCEP Eta model simulation of the summer climate over South America. Tarasova , T.A. , J. P. R. Fernandez , I.A. , Bisnitchenko , J.A. , Marengo , J.C. , Ceballos .
The LLJ in South America: Validation of the Eta/CPTEC during SALLJEX. G. Meira , C. Nobre , M. Sebuchi .
Simulation of the South American Monsoon System for future climates derived from the HadCM3 and HadAM3 GCMs. J. Marengo , T. Tarasova , R. 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. Saulo .
Modeling experiments, using the PSAS assimilation scheme in the AGCM CPTEC/COLA, and RPSAS in the regional model. I. Cavalcanti , J. Marengo , D. Herdies .
SALLJEX data assimilation experiments using Global and regional CPTEC Models. D. Herdies , R. Cintra , J. Aravena .
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 Skabar .
Assimilation experiments with and without SALLJEX data, combined with simple breeding experiments in order to evaluate bred vectors shape. E. Kalnay and Juan Ruiz .
Impact of the Finite Volume Numerical Scheme in RAMS Simulations of the Andes LLJ. P. Silva Dias , D. Soares Moreira , S. Barros , E. Freitas .
Improvements in the RAMS data assimilation system. P. Silva Dias , A. Gandu , D. Soares Moreira , S. Freitas .
Combined use of MMS and ARPS models for an improvement of the convection forcing in the SALLJ region. G. Raga , D. Rojo , M. Torres Brizuela , M. Nicolini .
Modeling experiments using different convection and radiation parameterization schemes, during the period of the experiment. I. Cavalcanti , S. Nilo , J. C. Chagas .

SALLJEX current research lines



THEME IV: Other SALLJ related studies

ARGENTINA
BRAZIL
CHILE
PARAGUAY
PERU
URUGUAY
USA

Impacts of deforestation of the Amazon basin on the Amazon region on the LLJ. [J. Marengo and collaborators.](#)

Variability of the convective cloudiness regime over eastern South America during the austral summer semester with emphasis on SACZ and the southeastern sector of the continent. [A. Diaz, P. Aceituno](#)

Relationship between the rainfall regime in Uruguay during the summer semester and preceding precipitation in central South America. [A. Diaz, R. Terra, G. Pisciotano, G. Cazes and M. Medina.](#)

Using ECMWF and NASA [scatterometer](#) ocean surface to study the process that control seasonal, interannual and [intraseasonal](#) variations of SALLJs. [R. Fu, H. Wang, T. Liu and W. Tan.](#)

Influence of cross-Andes flow on the South American Low-level jet. [R. Fu, H. Wang.](#)

Study of the ability of the regional climate model in reproduce observational features of the moisture transport associated to the LLJ occurrence periods. [T. Ambrizzi and collaborators.](#)

LLJs and the hydrologic cycle. [E. H. Berbery, E. Collini and V. Barros](#)

Mechanistic experiments to test the role of changes in the SALLJ transport in the initiation of droughts. [E. Kalnay and collaborators](#)

Basic water and momentum balances for the SALLJ region with and without SALLJEX data [E. Kalnay and collaborators](#)

SALLJEX Post-Field Activities



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- VAMOS/SALLJ Contribution to GCOS Action Plan over South America



Exchanges

No. 29 (Vol. 9, No. 1)

March 2004

South American Low Level Jet Experiment SALLJEX

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CLIVAR is a component of the World Climate Research Programme (WCRP).



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 on ***** 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/guidel.htm>

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Supplemental (electronic) Papers available under http://www.clivar.org/publications/exchanges/ex29/ex29_cont.htm
 Influence of Cross-Andes Flow on the SALLJs 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

The CLIVAR Newsletter Exchanges is published by the International CLIVAR Project Office.

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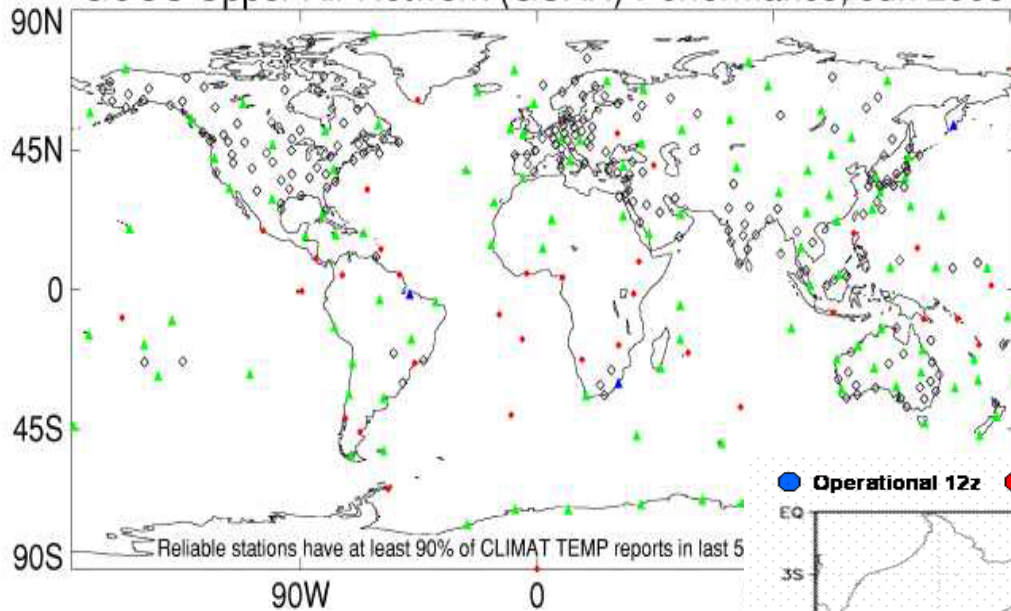
International CLIVAR Project Office
 Southampton Oceanography Centre, Empress Dock, Southampton, SO14 3ZH, United Kingdom

SALLJ Post-Field Activities



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- SALLJEX related posters to the CLIVAR Conference
- **VAMOS/SALLJ Contribution to GCOS Action Plan over South America**

GCOS Upper Air Network (GUAN) Performance, Jun 2003

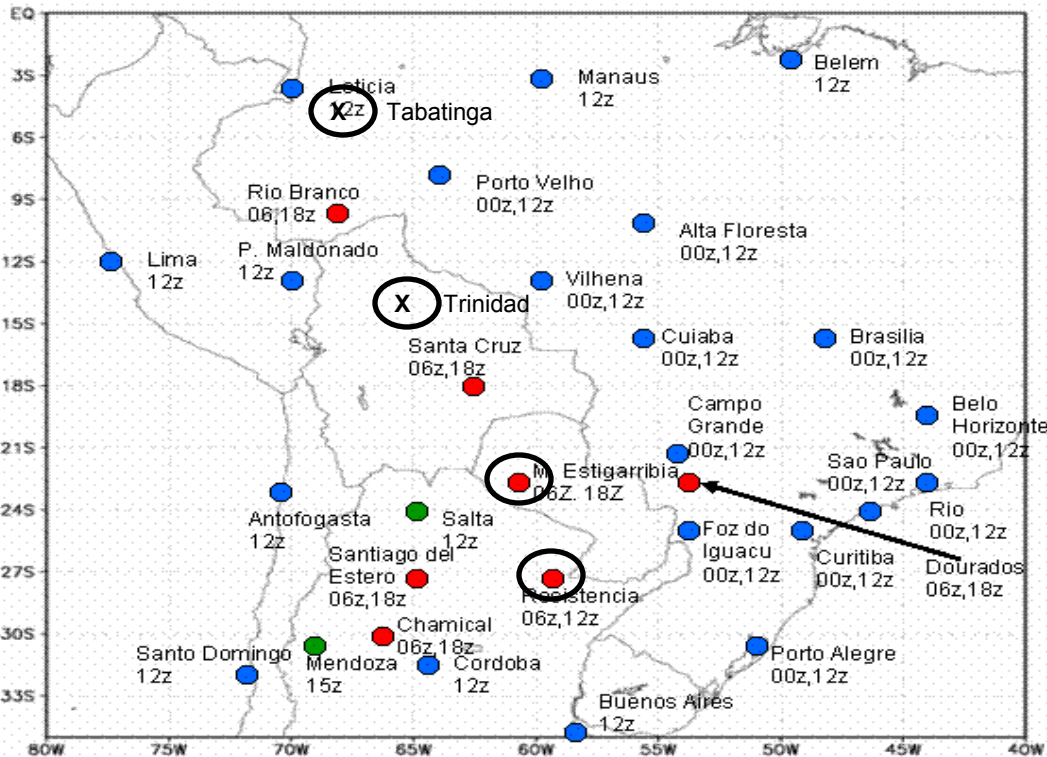


- ▲ GUAN station, CLIMAT TEMP report received
- ▲ Reliable GUAN station, no report received (3)
- ▲ Unreliable GUAN station, no report received (3)
- ◇ Reliable non-GUAN station, CLIMAT TEMP report received

VAMOS Contribution to GCOS

Project Brief: Enhancement of the GUAN network in Central South America

- Operational 12z
- Temporary
- Other Sondes



The two overarching questions of LBA

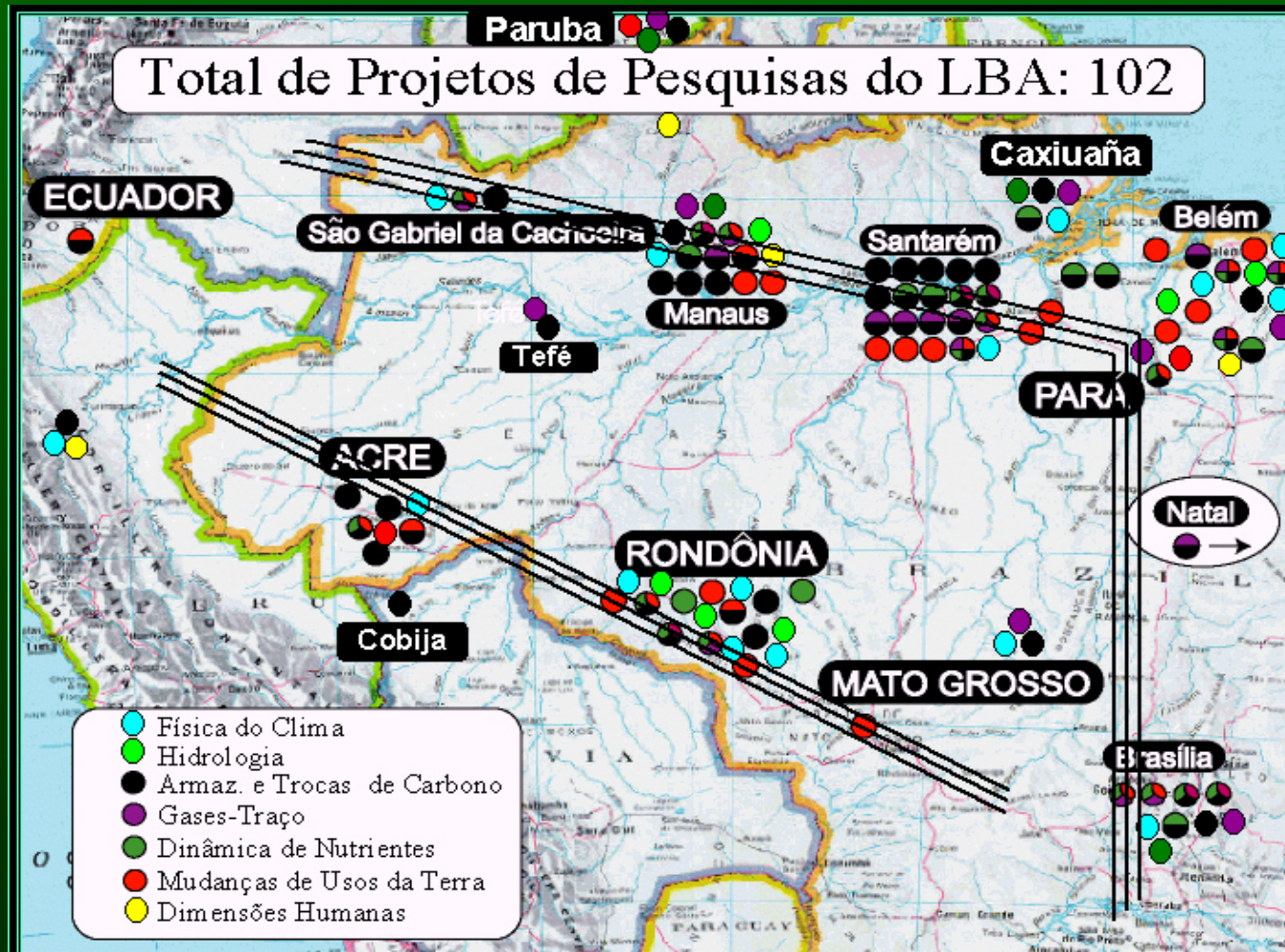


★ How Amazonia functions currently as a regional entity with respect to the natural cycles of water, energy, carbon, nutrient and trace-gases?

★ 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

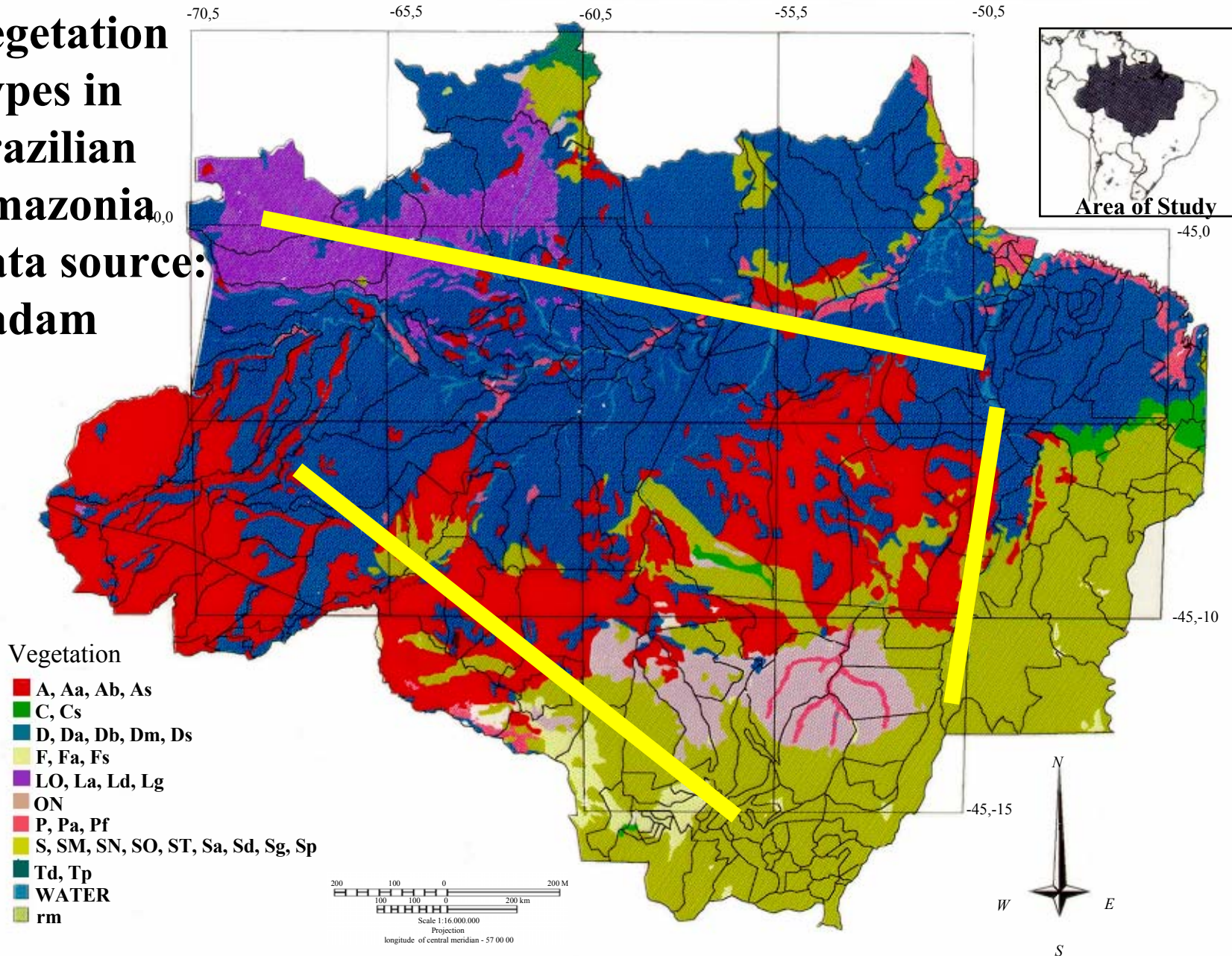
- 130 studies (30% completed) covering the 7 LBA themes
- Over 150 institutions from all Amazonian countries, US and EU
- Over 1200 participants (about 500 students; 160 PhD students)
- To date over 400 peer-reviewed articles in scientific literature



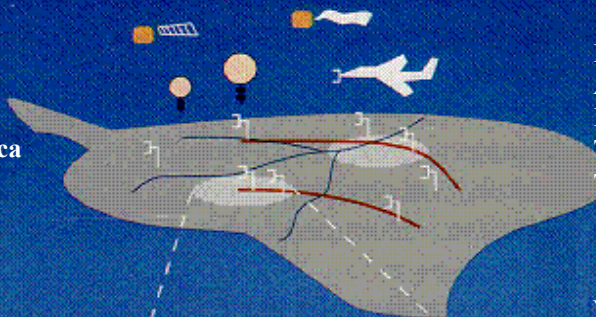
Research Strategy I: LBA ECOLOGICAL TRANSECTS

Vegetation Types in Brazilian Amazonia

Data source:
Radam



100-10000 km
Bacia Amazônica
[obs. contínuas]



Modelos de escala de bacias
Análise de dados(4DDA)
Produtos de SR de satélite
Transecções extensivas por avião
Transecções ecológica

10-100 km
2 Áreas de estudo
Rondônia
Pará
[CIC + obs. Contínuas]



Validação dos algoritmos dos satélites
Meteorologia de mesoescala
Hidrologia de sub-bacias
Fluxos medidos na superfície e por avião (H , λE , CO_2 , gases-traços, R \updownarrow)
Validação do SR de superfície e de aviões
Química da Atmosfera

-1 km
Sítios para as Torres
[CIC + obs. contínuos]

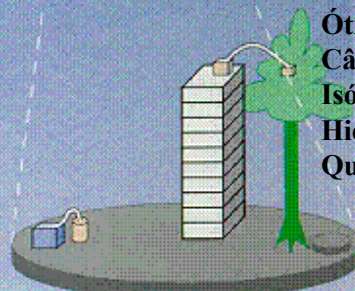


Medições de fluxo em torre
Química Atmosférica
Hidrologia de Micro Bacias
Química do escoamento

1-10 m
Estudos de processos
Sítios para validação



Sítios para validação



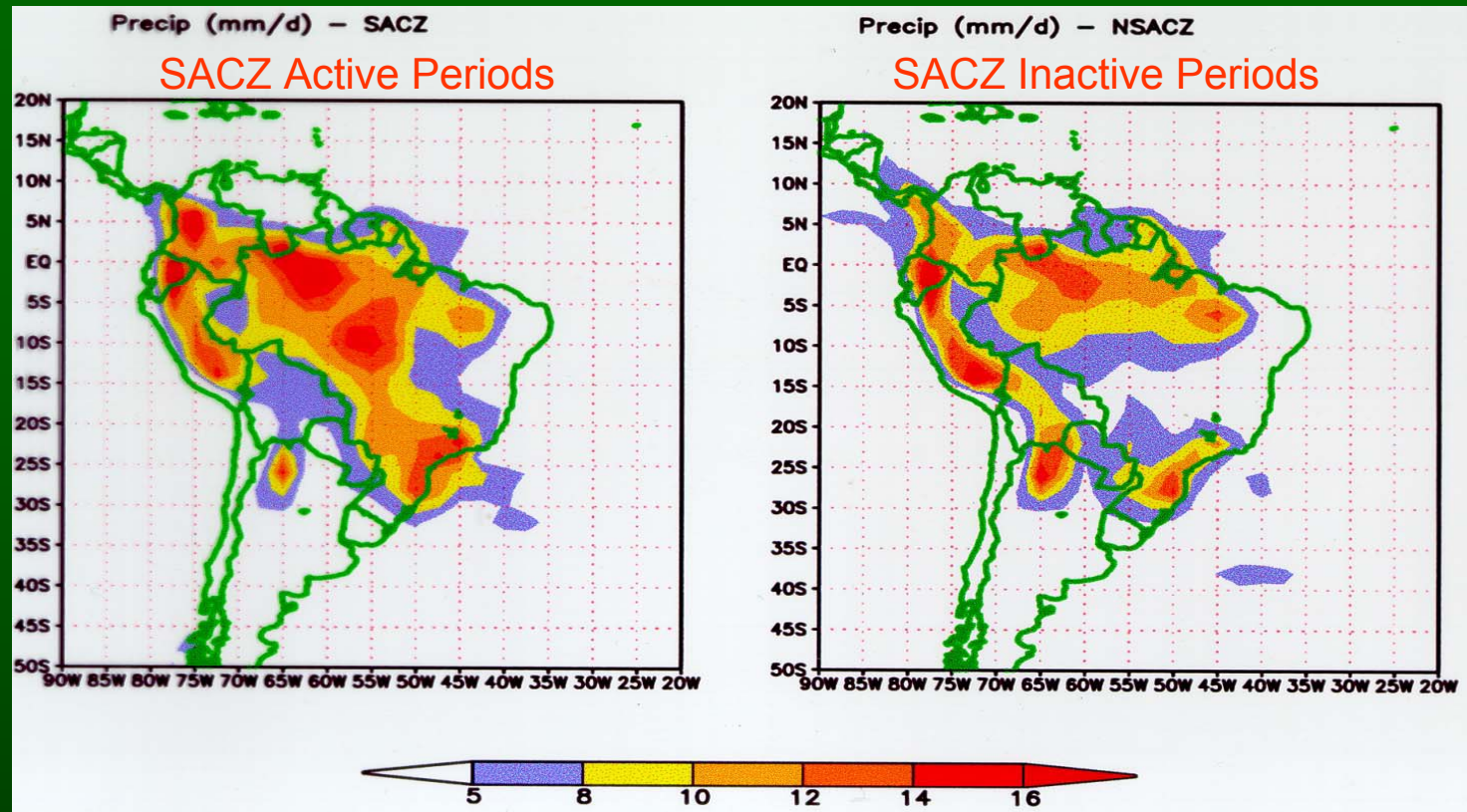
Sítios de estudos de processos

Estudo de processos
Fisiologia
Ótica de Fito-elementos
Câmara de solo
Isótopos
Hidráulica do solo
Química do solo

Sítios de validação
Alometria/Biometria
Alvos do SR

RESEARCH STRATEGY II: SCALING UP

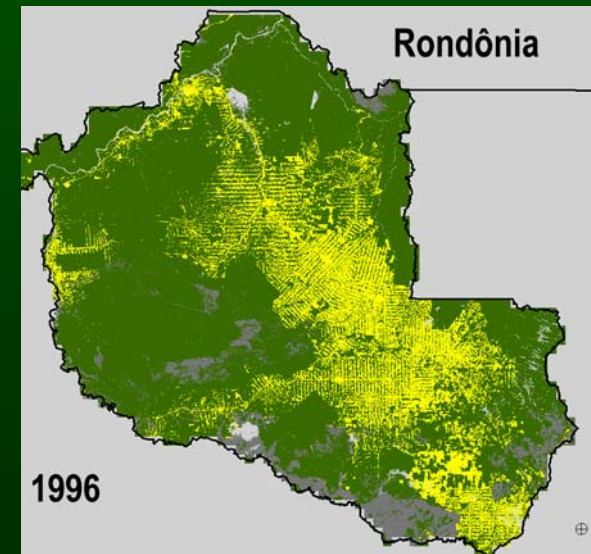
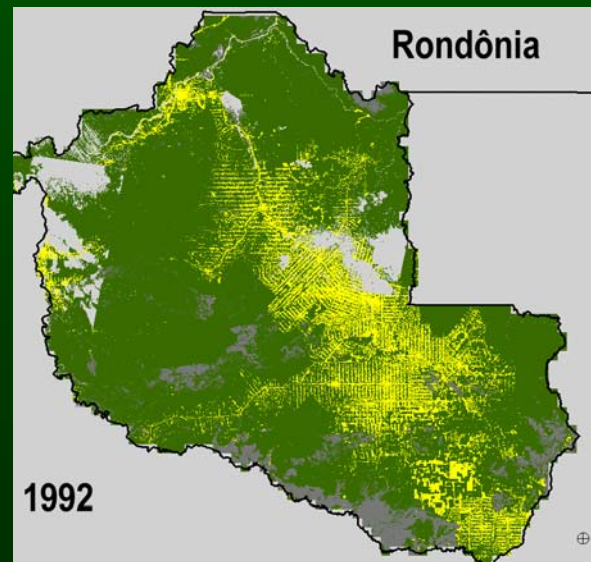
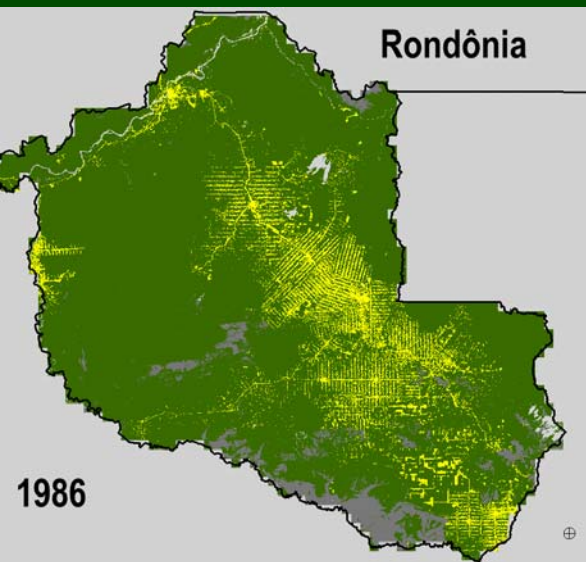
Water Budget – Convection Modes -



- 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



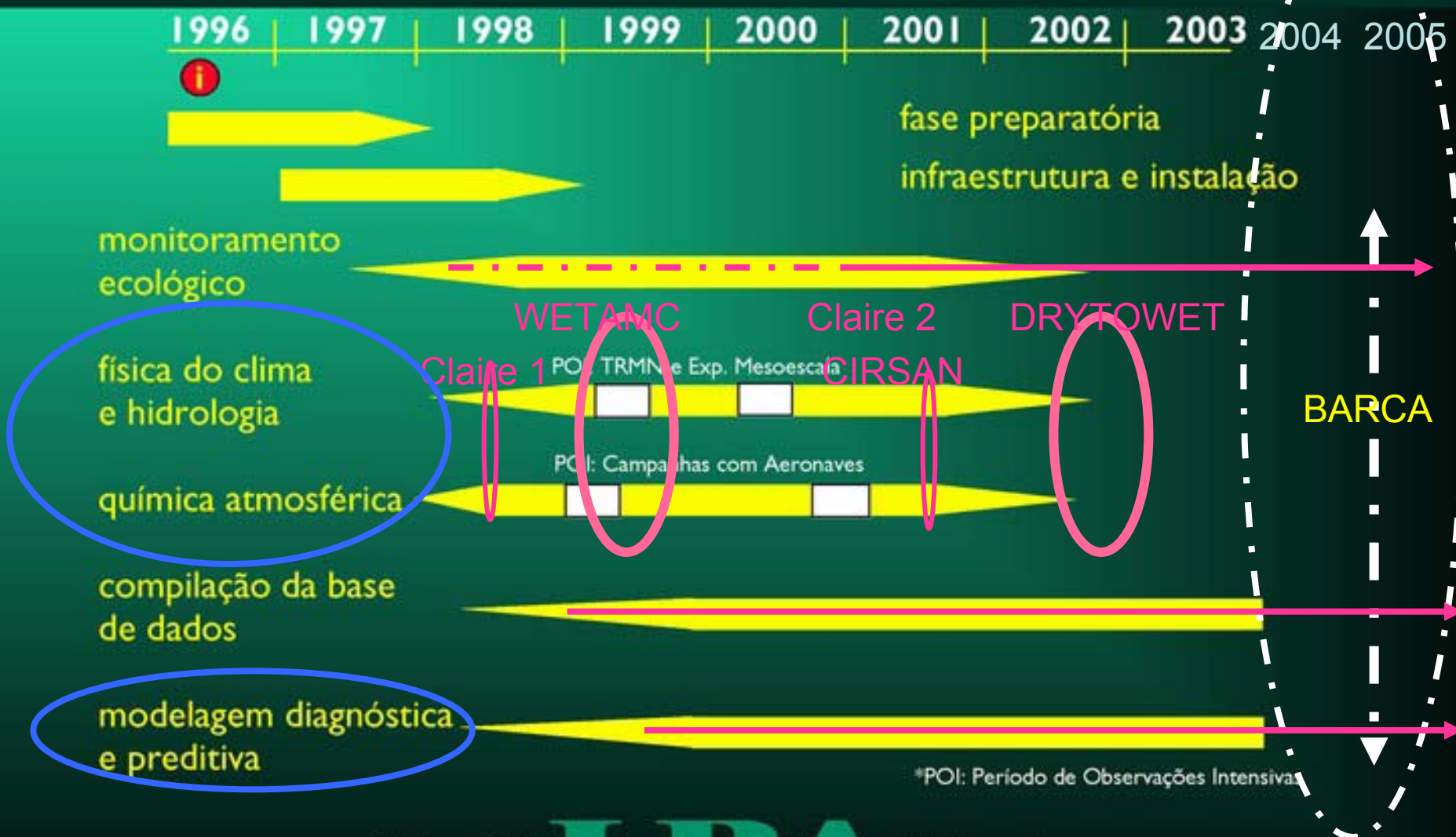
Realistic deforestation patterns: increase or decrease of precipitation?



Cronograma do LBA

Campanhas de medidas intensivas e monitoramento contínuo

Synthesis and Integration



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