



MONSOON EXPERIMENT SOUTH AMERICA (MESA)



An internationally coordinated, joint CLIVAR – GEWEX program aimed at providing:

- i) a better understanding of the South American monsoon system and its variability,
- ii) a better understanding of the role of that system in the global water cycle
- iii) improved observational data sets, and
- iv) improved simulation and monthly-to-seasonal prediction of the monsoon and regional water resources.

MESA Homepage:

<http://www.joss.ucar.edu/mesa>
(in preparation)



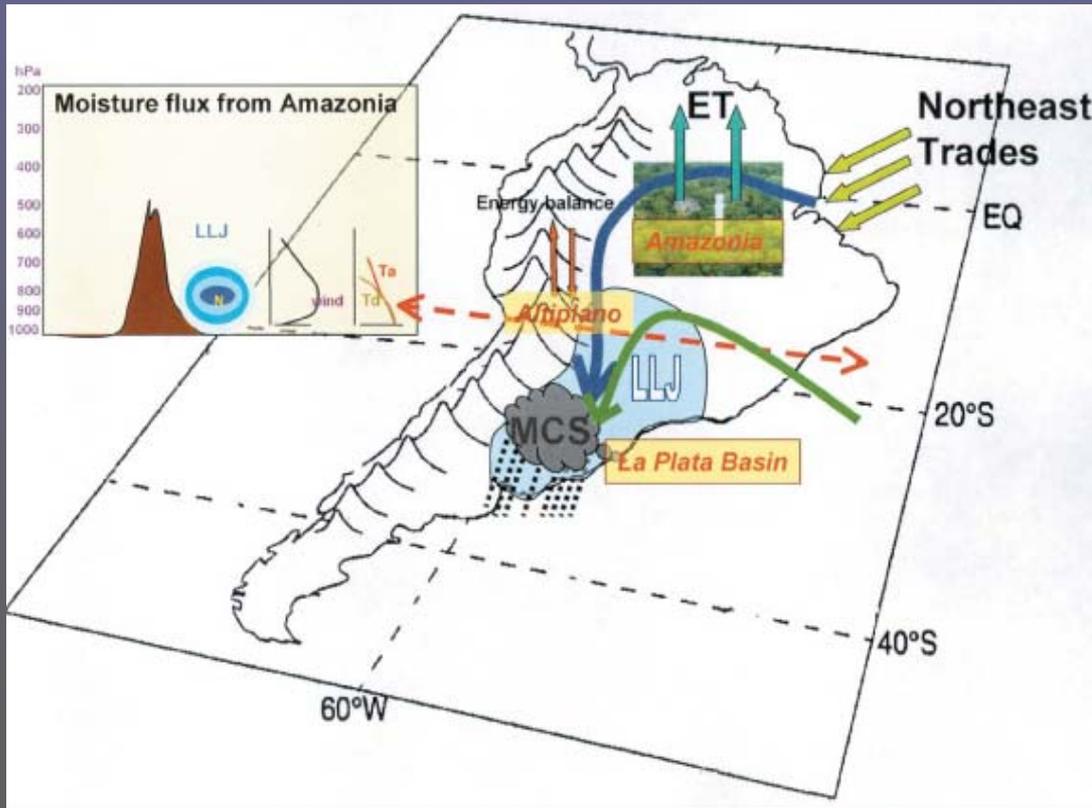
SALLJ Science goal

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 Objectives

- Diurnal variations of the SALLJ
- Detailed description of the 3-dimensional structure of the SALLJ
- The relationship between MCCs and the SALLJ
- Description of the heat low over the Chaco and NW Argentina



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)

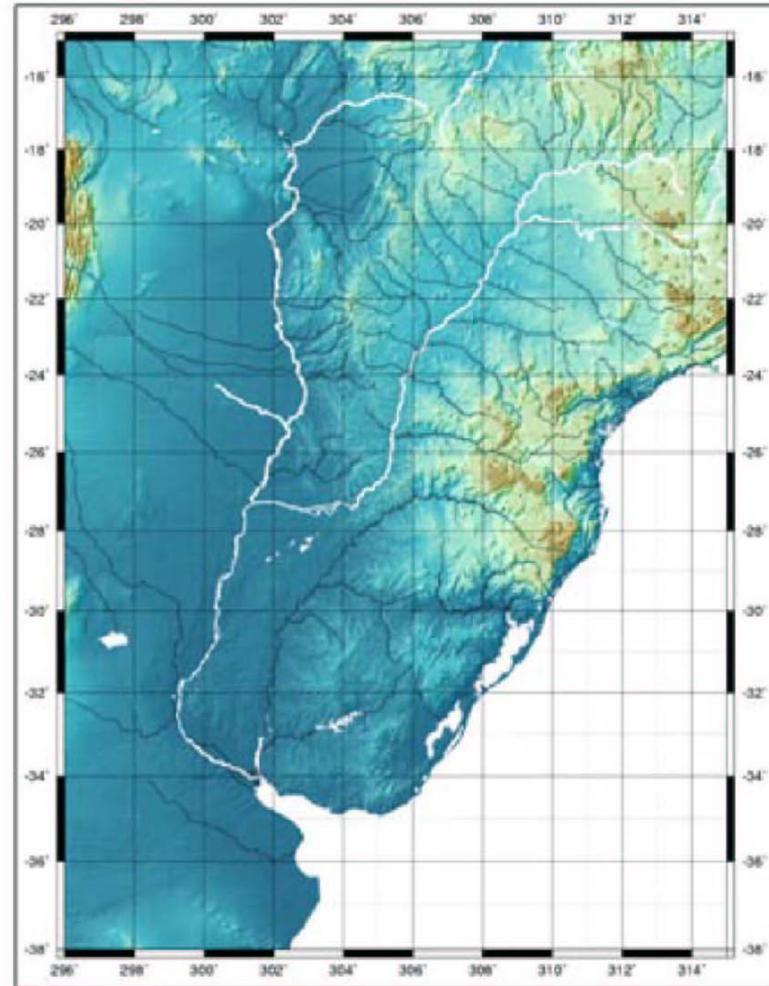
PLATIN SSG: *Walter Baetghen (IFDC, Uruguay), Julian Baez (DINAC, Paraguay), (Vicente Barros (UBA, Argentina), E. Hugo Berbery (U. Maryland, USA), Alexandre Guetter (SIMEPAR, Brazil), Dennis Lettenmaier (U. Washington, USA), C. Roberto Mechoso (Co-Chair, UCLA, USA), Edgard Montenegro (U. Cochabamba, 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 Continental Scale Experiment

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.



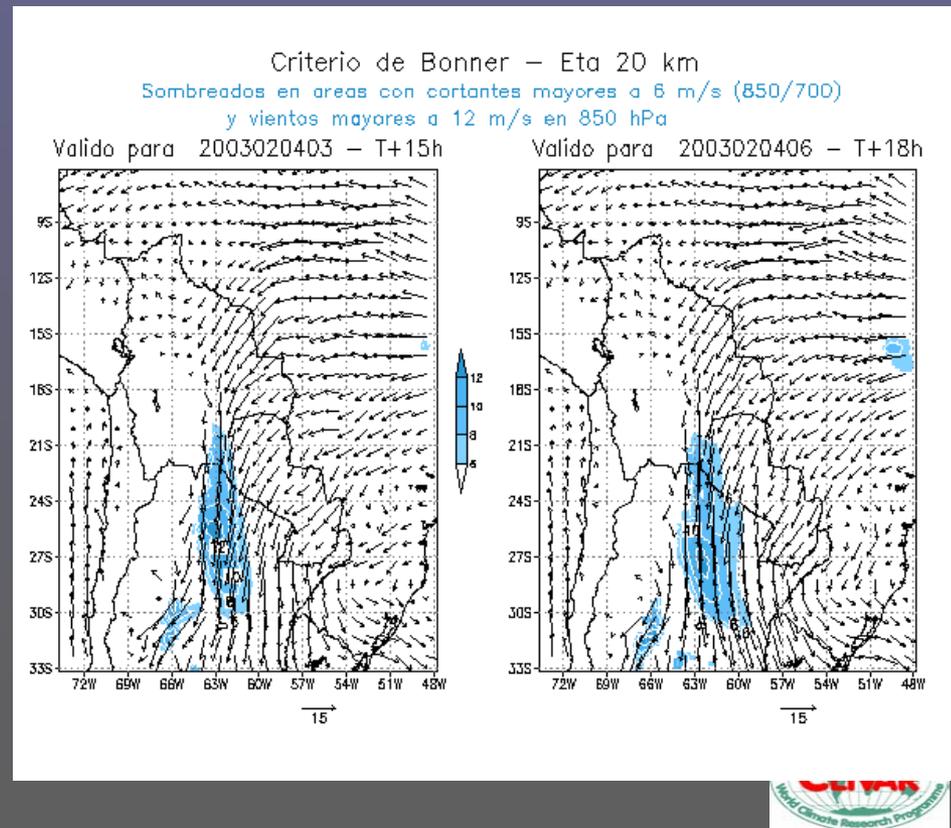
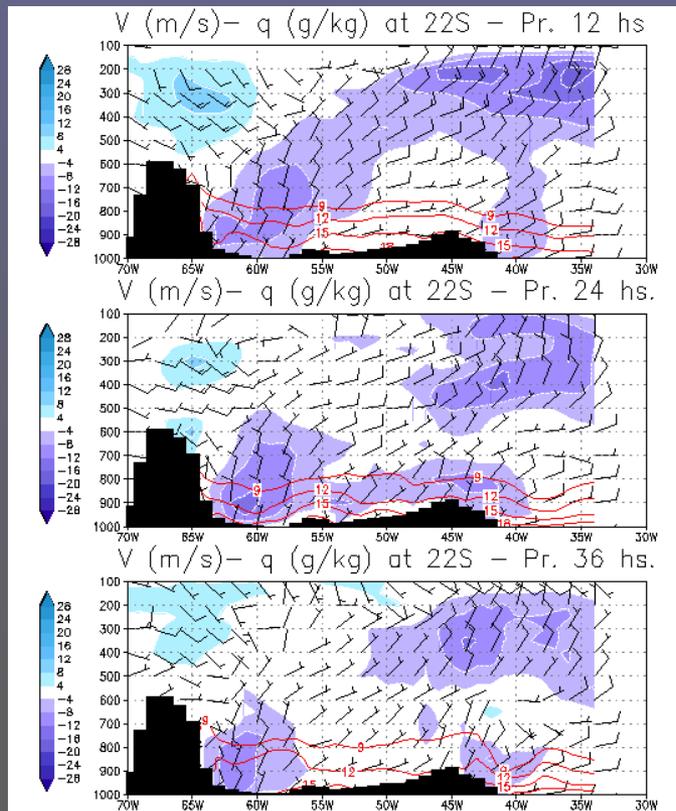
MESA IMPLEMENTATION

- **SALLJ empirical and modeling studies** (Coordinated modeling experiments. In US it also carried forward the joint PACS/GAPP Warm Season Precipitation Initiative) (2000-2003).
- **SALLJEX Field Campaign (2002+):**
 - Build-up, data collection and quality control (2002-2003)
 - Data analysis (2003-2005)
 - SALLJEX modeling experiments (2003+)
 - SALLJEX Data Workshop, Buenos Aires, Argentina (Dec 2003)
 - CLIVAR Exchanges special issue for SALLJ (May 2004)
 - SALLJEX overview paper to BAMS (in preparation)
 - VAMOS/SALLJ Contribution to GCOS Action Plan over South America (2003+)
- **PLATEX Field Campaign** (tentatively planned for 2007)
- **SALLJ, PLATIN Empirical and modeling studies** (New coordinated modeling experiments? In US in the joint CPPA Program) (2004+)
- **PLATIN SSG participates in a GEF-Funded Project** (2004+)

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



MESA modeling activities

- Some modeling issues after SALLJEX are still open:
 - Does SALLJEX data improve the understanding of the water budget of the Plata Basin? Does the uncertainty of the LLJ moisture transport have been reduced?
 - Does SALLJEX research improve the numerical model skill for predicting MCSs ?

Unified Vision of MESA



The unified program will facilitate the understanding, simulation and prediction of the components of the South American Monsoon System, their variations and connections with the extratropics.

MESA

PRA-1 SCIENTIFIC QUESTIONS

1. How are low-level circulations along the east slopes of the Andes (e.g. SALLJ) related to the diurnal cycle of moisture and convection? (*low-level circulation*)
2. What is the role of the SALLJ in moisture and energy exchange between the tropics and extratropics (*moisture transport & budget*)
3. What is the relationship between moisture transport and rainfall variability (e.g. mesoscale convective processes)? (*moisture transport*)
4. What is the typical life cycle of diurnal convective rainfall? Where along the Andes is convective development preferred? (*diurnal cycle*)
5. What are the fluxes of water (and energy) from the land surface to the atmosphere across the monsoon region, and how do these fluxes evolve in time? (*role of land surface*)

MESA

PRA-2 SCIENTIFIC QUESTIONS

1. What is the nature of the relationship between the MJO and South America precipitation? (*role of MJO*)
2. How does the MJO influence the frequency / intensity of transient (weather) events and the onset / demise of the monsoon?
(*dynamical linkages*)
3. How does intraseasonal variability influence the dominant sources of precipitable moisture for precipitation over tropical and subtropical South America? (*moisture sources*)
4. What are the relative roles of local and remote intraseasonal variability in maintaining the South American see-saw pattern? (*dynamical linkages*)
5. Can intraseasonal oscillations be a source of short term climatic predictability over South America? (*predictability sources*)

MESA

PRA-3 SCIENTIFIC QUESTIONS

1. What are the influences of the core monsoon region on the larger scales (e.g. relationships between precipitation variability, SACZ and see-saw pattern)?
(dynamical linkages)
2. What are the relative roles of local-vs-remote (e.g. tropical-vs-extratropical) SST's on monsoon predictability?
(role of SST's)
3. What are the relative roles of oceanic (e.g. SST) and continental (e.g. soil moisture) boundary forcing on the predictability of the monsoon?
(relative role of SST's and soil moisture)
4. Will seasonal predictability change as a function of land cover changes?
(role of landcover)
5. Can numerical models reproduce the observed summer precipitation in average years and years with influence of ENSO signal of different intensity and phase?
(role of ENSO)

MESA MODELING ROADMAP

- **Model and Diagnostic Activities**
 - *Exploration of the synergism between LLJs and MCSs*
 - *Impact of improved soil moisture initializations on precipitation simulation*
 - *Benchmark simulations of particular season; (hydrology emphasis)*
- **Data Assimilation**
 - *SALLJEX data impact studies on global and regional data assimilation systems*
 - *Analysis of “Day errors” using breeding vector techniques*
 - *High resolution South American climate analysis system for Regional Reanalysis and real-time monitoring*
- **Model and Forecast System Development**
 - *Model coordinate improvements for steep orography regions*
 - *Diurnal Cycle Experiments – multiyear simulations in AGCMS*
 - *MESA CPT (diurnal cycle of convection, MCS evolution)*

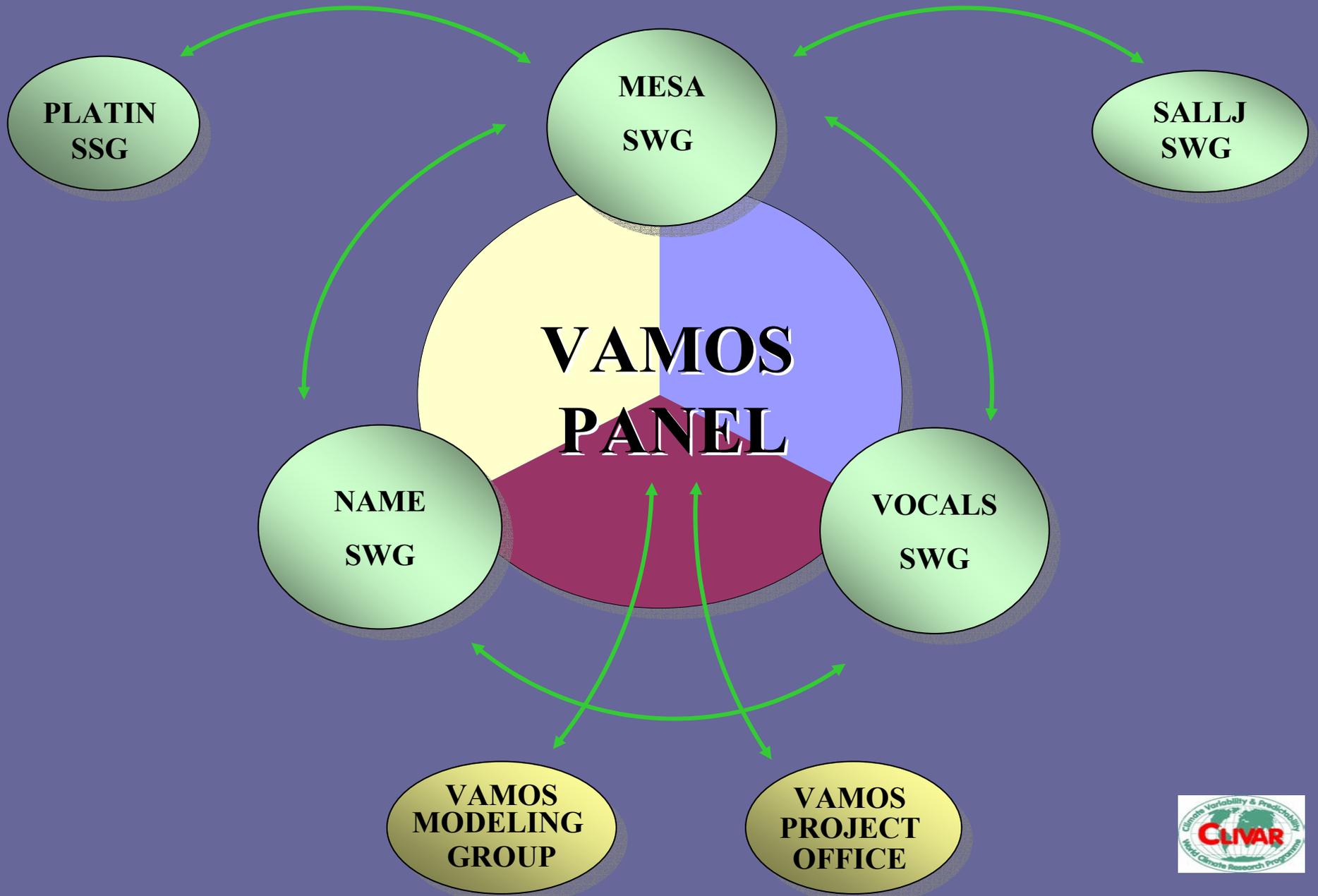
Modeling in VAMOS

- VAMOS can provide unique contributions to model development in the areas of:
 - Land Surface Processes (NAME and MESA)
 - Boundary Layer Clouds (VOCALS)
- VAMOS can also provide important contributions to improvement of model performance in the areas of:
 - Representation of orography
 - Cloud-Radiation interactions
 - Diurnal cycle, particularly for convection over land
 - Atmosphere-ocean interactions
- VAMOS also use models for:
 - Hypothesis testing
 - Assess the impact on predictability of data collected in process studies

VAMOS PANEL DECISION ON MODELING GROUP FOR VAMOS

- **The WCRP/CLIVAR VAMOS Panel has endorsed the concept of a “Modeling Group for VAMOS”. This Group will coordinate joint activities amongst VAMOS Science Components (i.e. MESA, NAME and VOCALS), make sure that the appropriate modelers participate, and facilitate links with operational centers.**
- **Initially the group will be adhoc, and will report its findings to the panel Co-Chairs, who will discuss them with the VAMOS Panel before implementation.**
- **The group will consist of two representatives from each of the 3 principal VAMOS Components (NAME, MESA, VOCALS) plus a member linking VAMOS modeling to WCRP activities. (Farfan, Mo, Saulo, Cavalcanti, Bretherton, VOCALS 2, Kirtman)**
- **Charge for the adhoc group:**
 - (i) Review the status of modeling relevant to VAMOS research.**
 - (ii) Organize a modeling session at VPM8 (March 2005) in order to bring together leading modeling groups focused on VAMOS topics, and to develop recommendations for a long-term modeling strategy.**

VAMOS PROGRAM STRUCTURE



Questions for the MESA meeting, June 22th

1. Which are the scientific issues regarding PRA-1 (diurnal cycle and mesoscale variability of circulation and precipitation) that still need to be addressed after SALLJEX? (modeling activities? Additional field experiments?)
2. Which should be the main scientific questions for PRA-2 (Intraseasonal variability) and PRA-3 (Interannual variability)?
3. Which are the process studies and modeling activities that need to be performed in order to address those scientific questions of PRA-2 and PRA-3?
4. Do we need more field experiments (besides PLATEX) in order to address PRA-2 and PRA-3 scientific questions?

