EVALUATION AND SENSITIVITY STUDIES OF SALLJ NUMERICAL SIMULATIONS

- Analysis Impact

- Model Validation

- Forecast Impact
EVALUATION AND SENSITIVITY STUDIES OF SALLJ NUMERICAL SIMULATIONS

• Analysis Impact
  (Demaria and Herdies et al.)

• Model Validation

• Forecast Impact
925 mb winds  January 23rd (12 UTC), 2003.
NCEP-NCAR (black), pibals (red), radiosondes (green)
925 mb winds  January 24\textsuperscript{th} (12 UTC), 2003. NCEP-NCAR (black), pibals (red), radiosondes (green)
MESA ACTIVITIES 2003

• A unified vision for MESA activities was presented during the VAMOS Miami meeting (April 2003), with the LLJ east of the Andes linking LBA to the La Plata basin.

• The field phase of SALLJEX (November 15 - February 28 2003) was successfully completed. The SALLJEX working group met at Miami for preliminary discussions on data issues, to design numerical experiments, and to plan the first data workshop. This will take place in Buenos Aires December 10 - 12 2003. See http://www.joss.ucar.edu/salljex/workshop and http://salljex.at.fcen.uba.ar/modeling for further details.

• Salljex upper level soundings have gone through a first quality control pass and are available through http://www.joss.ucar.edu/salljex/dm. There are some delays in obtaining precipitation data from Bolivia.

• The La Plata basin program (PLATIN) has been approved as a Continental Scale Experiment (September 2003).

• Funds were approved to plan a GEF project for La Plata basin with science input from VAMOS (November 2003).

• The Buenos Aires workshop (December 2003) is organized along the following themes: 1) SALLJ characteristics (structure and variability over different spatial and time scales); 2) SALLJ and rainfall events; 3) numerical modeling; and 4) other topics to be identified during the workshop. A diverse international participation is expected with modelers, and scientists interested in process studies, data analysis and data providers.
Inference

Structure near topography not well resolved in reanalysis (Evidence of same problems with GDAS, shown later)
The Figure shows the data that was used from the GTS and the SALLJEX for the simulations presented in the previous slide.
Experiments with the SALLJEX dataset using CPTEC Global Model

Dirceu L.Herdies, J.A. Aravéquia, J. Marengo, I. Cavalcanti and R. Cintra

Results from experiments using SALLJEX data assimilated for $q$ and $v$ (differences). For January 18 2003 (when an intense MCC was detected over Paraguay) the assimilation resulted on an increase of moisture at 850 hPa and on the meridional component of the wind over the region. Experiments were made using the CPTEC GCM T062L28 (~200kmX200km).
Inference

SALLJEX data have up to 5 m/s effect on analysis. This is evident over regions with scales on the order of 3,000 kms.

Later will be shown the impact of initial state changes over such regions.
EVALUATION AND SENSITIVITY STUDIES OF SALLJ NUMERICAL SIMULATIONS

- Analysis Impact

- Model Evaluation
  - Utah Global Model vs radiosondes (Saulo)
  - GDAS vs radiosondes (Byerle)

- Forecast Impact
Resistencia 17 Jan 2003, 06 UTC

wind direction (deg)

pressure (hPa)

- Utah Model
- Radiosonde data
EVALUATION AND SENSITIVITY STUDIES OF SALLJ NUMERICAL SIMULATIONS

- Analysis Impact

- Model Validation

- Forecast Impact
  Surrogate data sensitivity experiments (Saulo et al)
Overview:

- Current deterministic weather prediction typically has useful skill through the first week, but limited value in the second week.

- There may be many reasons why the second week may not typically be predictable, including the chaotic nature of atmospheric evolution, poor specification of initial state and of atmospheric boundary conditions.

- We focus upon the loss of predictability that may be associated with changes of the initial state due to different amounts of information available in analyzed research and operational data sets.

Goal: Determine the time at which detail of the initial state in targeted regions of the global atmosphere starts to impact atmospheric evolution at other locations.
Model and Data / Experimental Setup:

- **UGM (U/UTAH) RESEARCH**
  SPECTRAL, FINITE ELEMENT (129 X 115 pts)
  WAVE #56, 23 levels
  SIMPLE PHYSICS (CONV ADJ)
  ROTATE GEOGRAPHIC POLE TO REGION OF INTEREST
  VARIABLE RESOLUTION--LOCALLY ENHANCED RES.
  --1 DEG SPACING 45N TO NORTH POLE
  --2 DEG SPACING SOUTH OF 45N

- **GDAS DAILY ANALYSES** (1 DEG)

- **NCEP/NCAR DAILY REANALYSES** (2.5 DEG)

We target two locations that have received attention in recent field campaigns. We use UGM to study rate at which local, initial state changes made at these locations propagate around the world.

The first targeted region includes tropical and subtropical South America, which has been the focus of recent summer field experiments relevant to regional hydrology (e.g. SALLJEX).
hires sqrt(Enstrophy) 03013012, Sig .2

The graph shows the relationship between wave number and the root mean square (rms) of Enstrophy. Two lines are plotted:
- The solid line represents the reanalysis
- The dotted line represents gdas_1

The x-axis represents the wave number, ranging from 0 to 90. The y-axis represents the rms value in 1/s, ranging from 0 to 50.
Standard Uniform

Utah Global Model
Rotated Uniform

Utah Global Model
Rotated Stretched

Model Grid in Uniform

Utah Global Model
Local Targeting experiments to track influence of “initial uncertainty” over 2 regions --defined as NCEP/NCAR Rean (2.5 deg) minus GDAS (1 deg).
96 Hr Meridional wind Differences Sigma .2
Initial Uncertainty Over NE Pacific

Initial Uncertainty Over S. America
192 Hr Meridional wind Differences Sigma .2
Initial Uncertainty Over NE Pacific

192 HR

Initial Uncertainty Over S. America
Discussion:

These experiments were conducted for the period including the February snowstorm of 2003, over the NE U.S., which was relatively well forecast at longer ranges.

Enhanced detail of the initial state over South America influences deterministic forecasts around much of the Southern Hemisphere by day 7 and shows notable impact in the Northern Hemisphere after approximately day 10.

Enhanced detail of the initial state over the NE Pacific influences deterministic forecasts more strongly over the Northern Hemisphere after day 7. Influences in the Southern (summer) Hemisphere are less pronounced at day 10.
South America Targeting 17 Jan 03
SALLJEX—area Targeted moisture 0.87

17 Jan 03
17 Jan 03