Precipitation Estimates over South-America during SALLJEX.

Celeste Saulo, Juan Ruiz, Lorena Ferreira, Soledad Cardazzo\textsuperscript{(1)}
and
Julia N-Paegle\textsuperscript{(2)}

\textsuperscript{(1)} CIMA (UBA/CONICET), FCEN - University of Buenos Aires, ARGENTINA
\textsuperscript{(2)} Department of Meteorology, University of Utah, Salt Lake City, Utah
Motivation

- Subtropical South-America is changing its land-use practices at the same time that rainfall shifts are observed. Whether such practices modulate rainfall, or are an adjustment to rainfall changes is an unanswered question.
Potential explanations require:
- a more complete precipitation network over a longer period of time than currently available and
- to estimate the impact that changes in land-use have in rainfall distributions.

To address these issues we worked on:
- Calibration of CMORPH data over South America during SALLJEX period
- Land-surface interaction experiments
CMORPH validation/calibration

- Period: Dec 15 2002 - Feb 15 2003
- Only boxes with more than 2 obs. were used and accumulated precip. has been obtained using box averaging (40 km x 40 km)
- Several calibration algorithms have been tested. Best results were obtained with Bias Removal algorithm as a function of precipitation intensity (Hamill, 1999)
CMORPH: Bias and RMSE

- CMORPH overestimates rainfall (positive bias)
- Non-systematic errors are large
Temporal variability before calibration
The algorithm effectively removes biases, and biases have a regional dependency.
Temporal variability after calibration

- CENTRO Nº de datos=2105
- NOA Nº de datos=2748
- NE Nº de datos=6660
- BRAZIL Nº de datos=21151
Main results

- Calibration reduces systematic errors in CMORPH estimates
- Non-systematic errors are also found
- Calibration should take into account errors spatial variability (work in progress)
- Results are similar when only the operational raingauge network is used for calibration (instead of the SALLJEX enhanced network)
Land-surface interaction: sensitivity tests during a NAL-LLJ episode

Sensitivity experiments using WRF model:
- Horizontal Resolution: 50 km x 50 km, with 31 sigma levels.
- One 10-day run, starting on Jan 29, 2003. This case was chosen due to the persistence of the synoptic pattern.

<table>
<thead>
<tr>
<th>Soil moisture Initial condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
</tr>
<tr>
<td>E2</td>
</tr>
<tr>
<td>E3</td>
</tr>
<tr>
<td>E4</td>
</tr>
<tr>
<td>Ctr</td>
</tr>
</tbody>
</table>
WRF model sensitivity to parameterization specification

- Optimum design for representation of 2m T and precipitation for 10 different selections
## Sensitivity experiments

<table>
<thead>
<tr>
<th>Name</th>
<th>Number</th>
<th>Convective P.</th>
<th>PBL</th>
<th>Soil</th>
<th>Soil M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMYSU</td>
<td>1</td>
<td>BM</td>
<td>YSU</td>
<td>NOAH</td>
<td>GDAS</td>
</tr>
<tr>
<td>KFYSU</td>
<td>2</td>
<td>KF</td>
<td>YSU</td>
<td>NOAH</td>
<td>GDAS</td>
</tr>
<tr>
<td>KFCPTEC</td>
<td>3</td>
<td>KF</td>
<td>YSU</td>
<td>NOAH</td>
<td>CPTEC</td>
</tr>
<tr>
<td>KFSC</td>
<td>4</td>
<td>KF</td>
<td>YSU</td>
<td>NOAH</td>
<td>WRF</td>
</tr>
<tr>
<td>NOAHYSU</td>
<td>5</td>
<td>GRELL</td>
<td>YSU</td>
<td>NOAH</td>
<td>GDAS</td>
</tr>
<tr>
<td>RUCYSU</td>
<td>6</td>
<td>GRELL</td>
<td>YSU</td>
<td>RUC</td>
<td>GDAS</td>
</tr>
<tr>
<td>NOAHMYJ</td>
<td>7</td>
<td>GRELL</td>
<td>MYJ</td>
<td>NOAH</td>
<td>GDAS</td>
</tr>
<tr>
<td>5LMYJ</td>
<td>8</td>
<td>GRELL</td>
<td>MYJ</td>
<td>5L</td>
<td>-</td>
</tr>
<tr>
<td>KFGFDL</td>
<td>9</td>
<td>KF</td>
<td>YSU</td>
<td>RUC (GFDL)</td>
<td>GDAS</td>
</tr>
<tr>
<td>Mean</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
The color of each box denotes the best model configuration selected based on lowest bias and RMSE for 48-hr forecasts.

Model spread between “best” and “worse” estimates of 2m T.

Based on this comparison, configuration 4 was chosen for the land-surface interaction experiments.
Impact on precipitation fields

- Decreased SM
- Increased SM
Mean circulation anomalies at 06 UTC
Concluding remarks

- Land-surface interactions are stronger when soil moisture is decreased:
  - Precipitation is coherently reduced over southern South America
  - Northerly winds associated with the low level jet are enhanced, leading to a southward shift in precipitation
- Precipitation is locally enhanced when soil moisture is increased.
  - Though changes in circulation are noted, these changes are much less pronounced than in the dry case.