Choco and Caribbean low level jets: Observations and Sensitivity Analysis in Regional Climate Models

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Introduction
Choco and Caribbean low-level jets (ChococLLJ and CLLJ, respectively) are prominent circulation features of the intra-Americas climate. These jets contribute to wet seasons over the Colombian Pacific coast and southern Central America (Poveda & Mesa, 1999; Amador, 2006). However, few modelling and observational efforts have been carried out to study the influence of these jets on the hydroclimatology of the far eastern Pacific. This work shows preliminary results of modelling efforts as part of a research project funded by the COLCIENCIAS, to develop a two-year field work to measure the ChococLLJ, using upper-air soundings over the Colombian Pacific coast and offshore.

Objective
To evaluate the performance of different observational and reanalysis datasets and Regional Climate Models for representing the vertical and horizontal features of both the ChococLLJ and CLLJ.

Discussion
• As an initial modelling task motivated by Arias et al. (2015), we evaluated the sensitivity of convective parameterizations in two RCMs for seasonal simulations over CORDEX-CA, at 50 km resolution during 2010-2011 La Niña event.
• Validation of Reanalysis (CFSR, ERA-Interim, MERRA, NCEP-NCAR, JRA-55) with in-situ data over Panama show an underestimation of wind velocities and don’t capture the wind maxima around 925 hPa.
• Models are able to capture the main features of precipitation such as Inter tropical Convergence Zone (ZCIT) and South Atlantic Convergence Zone (SACZ), but fail to simulate the location and magnitude of precipitation maximum over the Pacific Colombian coast.
• A first qualitative assessment indicates that RegCM (MIT) and WRF (Grell 3) show better performance among the studied RCMs to simulate precipitation over the study area.
• Spatial correlation patterns between Regional Models and observational data sets (TRMM, CMAP, GPCP, PERSIANN) show that overall WRF performs better than RegCM.

References

Field campaigns
Off-Shore and inland

Source: DIMAR

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Preliminary Results

Annual Precipitation and Vertical Wind Profiles

FIGURE 1. (Left Panel) Annual precipitation (mm/day) during 2011 for different observational datasets and simulations of the RegCM and WRF models. The observational datasets correspond to CMAP, GPCP, PERSIANN, CRU, TRMM. The runs used three convective parameterizations: MIT (Emmanuel and Zivkovic-Rothman, 1999), Grell–MIT and Grell (1993) for RegCM and Kain-Fritsch, Betts-Miller-Janjić and Grell 3 for WRF (Right Panel) Vertical distributions of wind velocity during JJA 2010 from different reanalyses: CFSR, ERA Interim, MERRA, NCEP-NCAR, JRA-55. Sounding from http://weather.uwyo.edu/upperair/sounding.html

Differences of Seasonal Precipitation

2010 minus 2011 and Taylor diagram for MAM 2010 and SON 2010

FIGURE 2. (Top Panel) Differences of seasonal precipitation (mm/day) MAM 2010 minus MAM 2011 for CMAP, GPCP, PERSIANN, CRU, TRMM, RegCM (MIT), RegCM (Grell-MIT), RegCM (Grell), WRF (Kain-Fritsch), WRF (Betts-Miller-Janjič) and WRF (Grell 3). (Bottom Panel) Taylor diagram over the study region (8.75°S–28.75°N, 108.75°W–31.25°W) for MAM 2010 (left) and SON 2010 (right).

Parameterizations

<table>
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<tr>
<th>RegM (Giorgi et al., 2012)</th>
<th>WRF (Skamarock, et al., 2008)</th>
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Parameterizations

• Radiative transfer
• Precipitation
• Cumulus Parameterization
• Superficial processes
• Oceanic fluxes
• Planetary boundary layer
• Aerosols
• Microphysics

Source: DIMAR

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