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 (ChocoLLJ 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 ChocoLLJ, using upper-air soundings over the Colombian Pacific coast and off-shore.

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 ChocoLLJ 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 Intertropical 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 study the region.
- Spatial correlation patterns between Regional Models and observational data sets (TRMM, CMAP, GPCP, PERSIANN) show that overall WRF performs better than RegCM.

Preliminary Results

Annual Precipitation and Vertical Wind Profiles

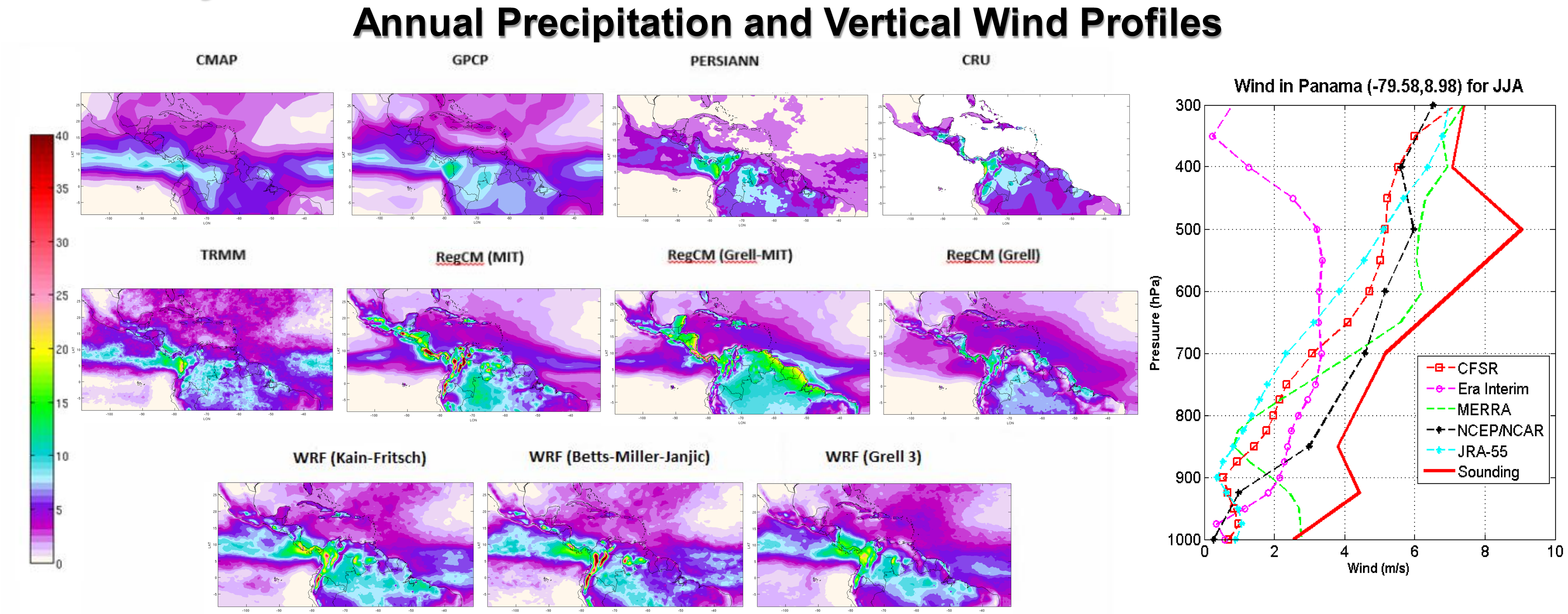


FIGURE 1. (Left Panel) Annual precipitation (mm/day) during 2011 for different observational datasets and simulations of the RegCM and WRF models. The observational datasets correspond to CMAP, GPCP, PERSIANN, CRU, TRMM. The runs used three convective parameterizations: MIT (Emanuel and Zivkovic-Rothman, 1999), Grell-MIT and Grell (1993) for RegCM and Kain-Fritsch, Betts-Miller-Janjic and Grell 3 for WRF. **(Right Panel)** Vertical distributions of wind velocity during JJA 2010 from different reanalysis: 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

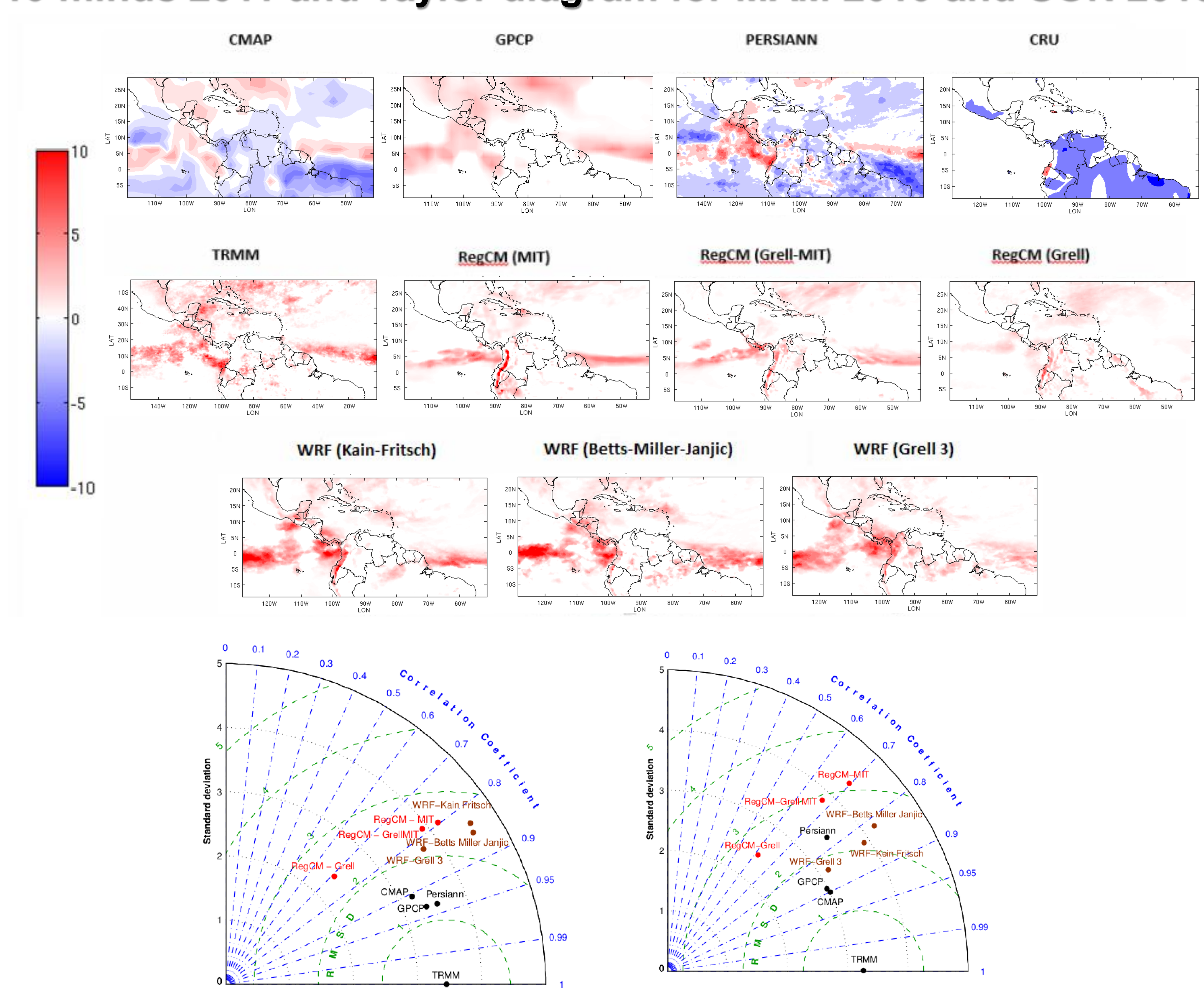
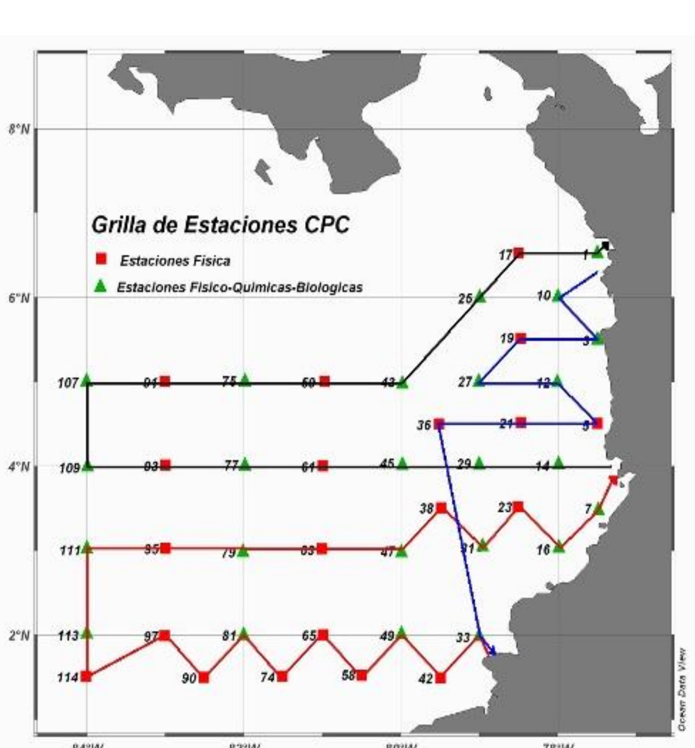


FIGURE 2. (Top Panel) Differences of seasonal precipitation (mm/day): MAM 2010 minus MAM 2011 for CMAP, GPCP, PERSIANN, CRU, TRMM, RegCM (MIT), RegCM (Grell-MIT), RegCM (Grell), WRF (Kain-Fritsch), WRF (Betts-Miller-Janjic) and WRF (Grell 3). **(Bottom Panel)** Taylor diagram over the study region (8.75ºS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

Field campaigns

Off-Shore and inland



Source: DIMAR

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Parameterizations

	RegM (Giorgi *et al.*, 2012)	WRF (Skamarock, *et al.*, 2008)
Radiative transference	Modified CCM3	Dudhia Shortwave Scheme, RRTM Longwave Scheme
Precipitation	SUBEX	
Cumulus Parameterization	Grell, MIT, Grell-MIT	Kain–Fritsch Scheme; Betts–Miller–Janjic (run2); and Grell 3D Ensemble
Superficial processes	BATS	Unified Noah Land Surface Model
Oceanic fluxes	Zeng	
Planetary boundary layer	Modified Holtslag	Mellor–Yamada–Janjic Scheme (MYJ)
Aerosols	Solmon	
Microphysics		WRF Single–moment 6–class Scheme

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