CHOCO-JEX: A Research Programme Focused on the CHOCO Low-level Jet over the Far Eastern Pacific and Western Colombia: Numerical Simulations

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Introduction

The Choco low-level jet (ChocoJet) is a prominent circulation feature of the Intra-Americas climate over the far eastern Pacific. ChocoJet has been related to the formation of large and frequent Mesoescale Convective Systems over the far eastern Pacific and inland over the world-record rainy region of western Colombia (Poveda & Mesa, 1999; 2000). However, few modelling and observational efforts have been carried out to study the jet space-time variability and its relationship to precipitation diurnal cycle over the far eastern Pacific. This work uses a set of simulation sensitivity experiments and observations during ChocoJEX-November 2016 to evaluate the diurnally forced gravity waves from the Andes as the main mechanism for the midnight-dawn land-to-ocean propagation of precipitation (Mapes *et al*., 2003).

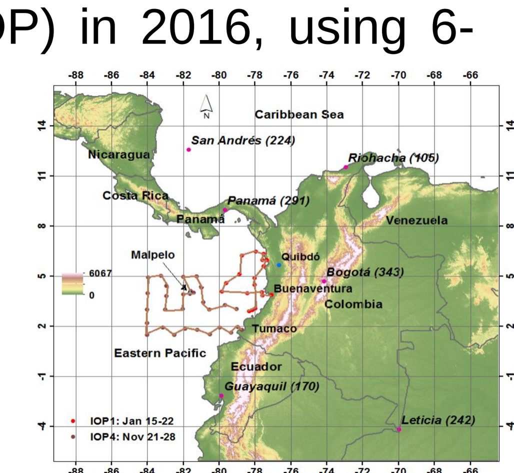
Objective

To identify the role of the diurnally forced gravity waves in the formation of precipitation over the ocean-land interface over western Colombia.

CHOCO-JEX Experiment

A pioneering interinstitutional partnership among the National University of Colombia, the Colombian Air Force, the Colombian Navy and the Desert Research Institute (University of NV) involving 4 week-long Intensive Observing Periods (IOP) in 2016, using 6-hourly upper-air soundings :

- IOP1: January 15-22 .
- IOP2: Quibdó, June 25-Jul 1
- IOP3: Quibdó, October 15-22
- IOP4: November 21-28

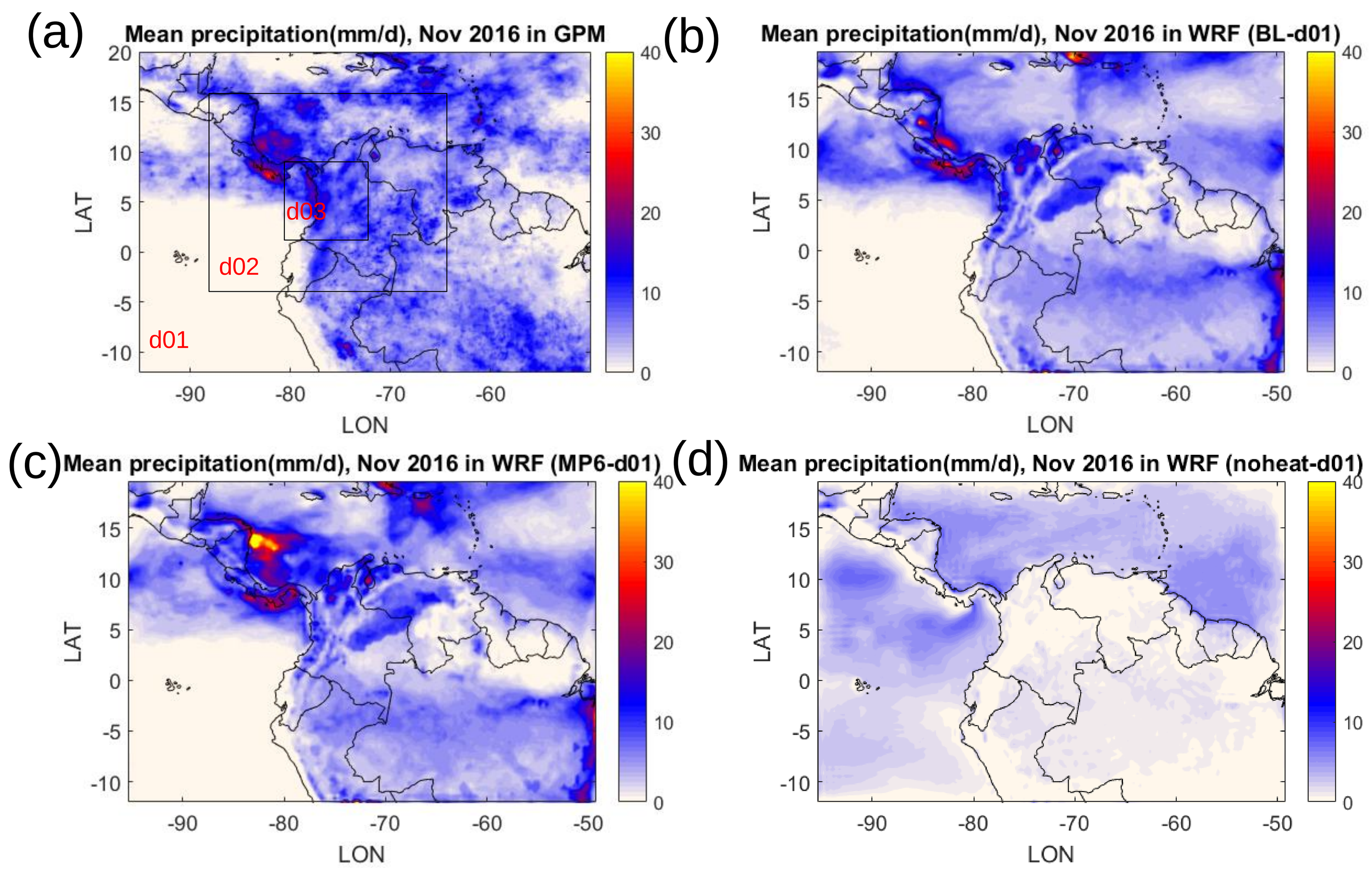


Simulation Experiments

A suite of different sensitivity experiments using WRF 3.8.1 was carried out for the following three nested domains at 36, 12 and 8 km over the Central American Cordex region:

- MP8(BL): Thompson Microphysics Scheme.
- MP6: Single–moment 6–class Scheme.
- No-heat: Turning off latent heat.

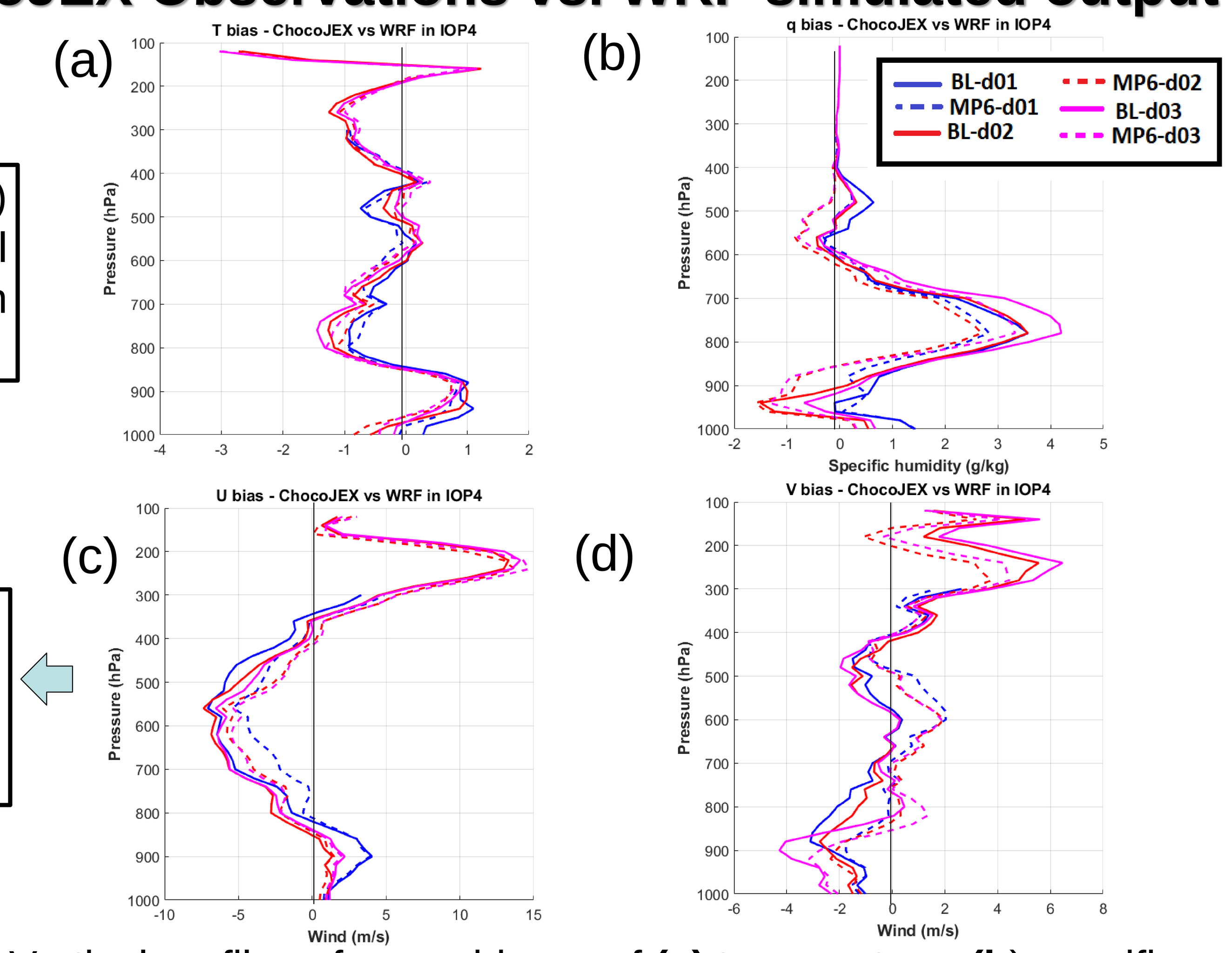
Monthly Precipitation in November 2016



Three nested domains (BL-MP6) shows similar features from general circulation. Large difference in oceanic-land rain in noheat.

FIGURE 1. (Top Panel) Monthly precipitation in November, 2016 for domain 1 (36 km) of: (**a**) observations (GPM), and simulations: (**b**) baseline (BL), (**c**) MP8, and (d) No-Heat.

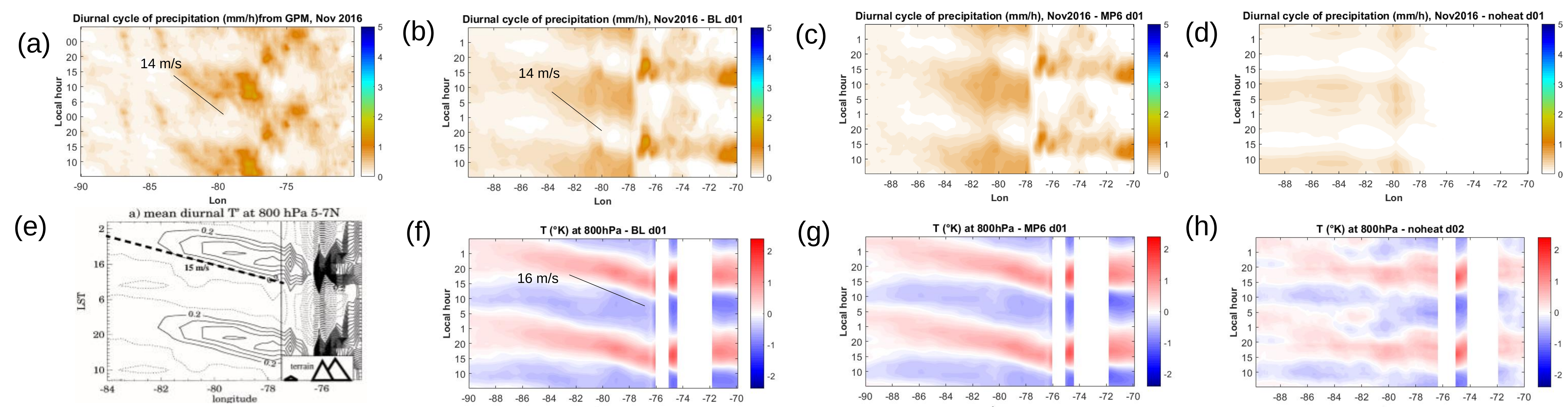
ChocoJEX Observations vs. WRF simulated output



Three domains shows similar mid-to-upper tropospheric variations in T, q, U and V against ChocoJEX obs. during IOP4

FIGURE 2. Vertical profiles of mean biases of **(a)** temperature, **(b)** specific humidity, **(c)** zonal wind and **(d)** meridional wind for BL and MP6 in d01, d02 and d03 compared against the independent IOP4 ChocoJEX soundings.

Diurnal Cycle of Precipitation and Temperature Perturbations



Mapes *et al*. (2003)

FIGURE 3. Hovmollers of the mean diurnal cycle of precipitation averaged over 5N-7N during November, 2016 of: **(a)** observations (GPM), simulations: **(b)** BL-d01, **(c)** MP6-d01, **(d)** noheat-d01and **(e)** GPI during Ago-Sep 1997-1998 (Mapes *et al., 2003).* Hovmollers of the temperature perturbations (K) averaged over 5N-7N at 800 hPa respect to mean diurnal cycle of **(f)** BL-d01, **gc)** MP6-d01, **(h)** noheat-d01

Conclusions

- All domains show similar diurnal mid-to-upper trophospheric variations in temperature, specific humidity, zonal and meridional wind component, showing no significant improvements with finer resolution (*Love et al*., 2011). There is, however, some scale dependency for d03 exhibiting the largest variations between 700-800 hPa.
- BL and MP6 resemble GPM diurnal cycle of precipitation over the Colombian Pacific and the Cauca River valley, and a near shore earlier peak during the morning hours.
- No propagation of the T' and precipitation in noheat run suggests moisture processes inland as key driver of the diurnal cycle of precipitation in adition to Mapes et *al*. (2003) approach.

References

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