# PRODUCING HIGH SPATIAL RESOLUTION CLIMATE SCENARIOS FOR TROPICAL AMERICA AND COLOMBIA USING WRF MODEL

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#### ABSTRACT

The results of 30x30 kms spatial resolution dynamic downscaling for tropical America (the domain 30-120°W and 15°S-25°N that includes Northen South America, Central America and Caribbean) using WRF model, are presented. Simulations for 1981-2015 period with CFSR reanalysis as boundary conditions were made for validation and calibration, and for climate change scenarios, two CMIP5 models (CCSM4 and MPI-ESM-MR) for the RCP 4.5 scenario at 2011-2040 period are presented. The progress in a project oriented to produce high spatial resolution (10x10 kms) climate change scenarios for northwestern of South America also will be exposed. This presentation summarizes the advances achieved by the research group "Weather, climate and society" in the project "Analysis of the regional expressions of the global warming and climate change in Colombia".

## INTRODUCTION

The global models used in the CMIP5, that supported the IPCC AR5, have a very gross spatial resolution (the finest resolution is 110 x 110 kilometers). However, in different regions for practical purposes it is necessary to have information on climate change scenarios in resolutions of the order of 50 x 50 kms and more detailed spatially. An option to have this information is the dynamic downscaling of the global models using regional models in high spatial resolution (less than 50 x 50 kms). Several regional models (REMO, PRECIS, among others) have been used for this purpose. In this work the WRF model was used to generate spatial resolution scenarios (30 x 30 km) for tropical America. This poster summarizes the results obtained in climate change scenarios building for annual precipitation and temperature for the period 2011-2040, based on CCSM4 and MPI-ESM-MR data.

### **MATERIALS AND METHODS**

#### **CORRELATION COEFFICIENTS**

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Simulations were made over two domains: the first one at 30x30 kilometers of spatial resolution covering Tropical America, and the second one at 10x10 kilometers covering Colombia, Ecuador, Panama and part of the Northern South America. As boundary conditions, data at 0.5° (55Km aprox.) from Climate Forecast System Reanalysis (CFSR) were used. For scenarios, data from CCSM4 and MPI-ESM-MR models were used. The simulations were made for 1981-2015 period for CFSR data, and 1981-2005 period for CCSM4 and MPI-ESM-MR models as historical data, and 2011-2040 period under RCP 4.5 for climate change scenarios.

The monthly historical data generated with WRF simulation for the first domain (30x30Km) were validated with University of DeLaWare data (Willmott & Matsura, 2001). In all cases, correlation and BIAS shows good results for most of the South and Central America and the Carribean. For the second domain (10x10Km), the results were validated in multiple studies with station data (Armenta, 2013; Serna, 2013; Pabón et. al. 2013; Peña, 2016; Bulla-Portuguez, 2017).





#### FOR MEAN TEMPERATURE



#### **CLIMATE CHANGE SCENARIOS: RESULTS**







CHANGE IN ANNUAL PRECIPITATION (%) RCP 4.5 2011-2040 vs. HISTORICAL 1981-2015

# CHANGE IN ANNUAL MEAN TEMPERATURE (°C) RCP 4.5 2011-2040 vs. HISTORICAL 1981-2015



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