



## **Climate change projections for winter precipitation over Tropical America using statistical downscaling**

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In this study the Principal Component Regression (PCR) method has been used as statistical downscaling technique for simulating boreal winter precipitation in Tropical America during the period 1950-2010, and then for generating climate change projections for 2071-2100 period. The study uses the Global Precipitation Climatology Centre (GPCC, version 6) data set over the Tropical America region [30°N-30°S, 120°W-30°W] as predictand variable in the downscaling model. The mean monthly sea level pressure (SLP) from the National Center for Environmental Prediction - National Center for Atmospheric Research (NCEP-NCAR reanalysis project), has been used as predictor variable, covering a more extended area [30°N-30°S, 180°W-30°W]. Also, the SLP outputs from 20 GCMs, taken from the Coupled Model Intercomparison Project (CMIP5) have been used. The model data include simulations with historical atmospheric concentrations and future projections for the representative concentration pathways RCP2.6, RCP4.5, and RCP8.5. The ability of the different GCMs to simulate the winter precipitation in the study area for present climate (1971-2000) was analyzed by calculating the differences between the simulated and observed precipitation values. Additionally, the statistical significance at 95% confidence level of these differences has been estimated by means of the bilateral rank sum test of Wilcoxon-Mann-Whitney. Finally, to project winter precipitation in the area for the period 2071-2100, the downscaling model, recalibrated for the total period 1950-2010, was applied to the SLP outputs of the GCMs under the RCP2.6, RCP4.5, and RCP8.5 scenarios. The results show that, generally, for present climate the statistical downscaling shows a high ability to faithfully reproduce the precipitation field, while the simulations performed directly by using not downscaled outputs of GCMs strongly distort the precipitation field. For future climate, the projected predictions under the RCP4.5 and RCP8.5 scenarios show large areas with significant changes. For the RCP2.6 scenario, projected results present a predominance of very moderate decreases in rainfall, although significant in some models.

**Keywords:** climate change projections, precipitation, Tropical America, statistical downscaling.

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