



Statistical downscaling of summer precipitation over northwestern South America

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In this study a statistical downscaling (SD) model using Principal Component Regression (PCR) for simulating summer precipitation in Colombia during the period 1950-2005, has been developed, and climate projections during the 2071-2100 period by applying the obtained SD model have been obtained. For these ends the Principal Components (PCs) of the SLP reanalysis data from NCEP were used as predictor variables, while the observed gridded summer precipitation was the predictand variable. Period 1950-1993 was utilized for calibration and 1994-2010 for validation. The Bootstrap with replacement was applied to provide estimations of the statistical errors. All models perform reasonably well at regional scales, and the spatial distribution of the correlation coefficients between predicted and observed gridded precipitation values show high values (between 0.5 and 0.93) along Andes range, north and north Pacific of Colombia.

Additionally, the ability of the MIROC5 GCM to simulate the summer precipitation in Colombia, for present climate (1971-2005), has been analyzed by calculating the differences between the simulated and observed precipitation values. The simulation obtained by this GCM strongly overestimates the precipitation along a horizontal sector through the center of Colombia, especially important at the east and west of this country. However, the SD model applied to the SLP of the GCM shows its ability to faithfully reproduce the rainfall field. Finally, in order to get summer precipitation projections in Colombia for the period 1971-2100, the downscaled model, recalibrated for the total period 1950-2010, has been applied to the SLP output from MIROC5 model under the RCP2.6, RCP4.5 and RCP8.5 scenarios. The changes estimated by the SD models are not significant under the RCP2.6 scenario, while for the RCP4.5 and RCP8.5 scenarios a significant increase of precipitation appears regard to the present values in all the regions, reaching around the 27% in northern Colombia region under the RCP8.5 scenario.

Keywords: Statistical downscaling, precipitation, Principal Component Regression, climate change, Colombia.

ACKNOWLEDGEMENTS

This work has been financed by the projects P11-RNM-7941 (Junta de Andalucía-Spain) and CGL2013-48539-R (MINECO-Spain, FEDER).