Geophysical Research Abstracts
Vol. 15, EGU2013-12167, 2013
EGU General Assembly 2013

Regional Climate Change Projections over Northeast Brazil

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Climate change and climate change impact studies often require a spatial resolution beyond the horizontal grid spacing of the data generated by Global Climate Models (GCMs). Dynamical Downscaling is one of techniques that allow regionalization of information from such models, in which the GCM data drive a Regional Climate Model (RCM) that in turn, at least theoretically, presents the climatological fields in more detail and can add value to climatic analysis. In this context, CORDEX is a coordinated experiment that standardizes dynamical downscaling simulations over continental regions, to provide a contribution from the regional climate modeling community to the IPCC/AR5 and beyond. Because computer resources are limited, a modeling group involved in CORDEX typically chooses one or few of the suggested domains, and use one or a few CMIP5 GCM data to drive its regional model. At the State University of Ceará (UECE), in Brazil, we used RAMS6.0 (Regional Atmospheric Modeling System Version 6.0), driven by HadGEM2-ES (Hadley Centre Global Enviroment Model Version 2 – Earth System) data, over a extended CORDEX Central America domain (longitude: 124.5W to 24.5W, latitude: 33.5N to 17.5S). This work presents the evaluation of climatological features of precipitation and temperature over Northeast Brazil region (longitude: 47W to 34.5W, latitude: 2.5S to 17.5S) for 20 years of the historical period (1985-2005) evaluating short-term (2015-2035), mid-term (2045-2065) and long-term (2079-2099) changes, under the RCP4.5 e RCP8.5 scenarios. For the historical period, the results were compared against several observed data sets, in order to evaluate the performance of RAMS6.0 nested to HadGEM2-ES. The correlation between the simulated and observed annual cycle of precipitation is high (above 0.93). RAMS6.0 shows a wet bias of 0.706 mm/day that is larger than HadGEM2-ES bias (0.197 mm/day), however the regional model corrects the month of maximum precipitation (the global model anticipates the peak precipitation to February, whereas it appears in March in the observations. Regarding temperature, RAMS6.0 presents, aslight cold bias (-0.421ºC/day), which is smaller in magnitude than HadGEM2-ES warm bias (0.840ºC/day). For the future periods, RAMS6.0 predict an increase in long-term precipitation over NEB, especially under the higher GHG emission scenario (RCP8.5), during the rainy season but simulates a reduction in precipitation during the dry season. As for temperature, both models simulate an increased warming during the 21st century, with the regional model predicting a temperature increase greater than the global model. Long term changes projected by RAMS6.0 correspond to an increase in the annual mean temperature of 5.13ºC over NEB, whereas HadGEM2-ES simulates a variation of 3.55ºC, both in the RCP8.5 scenario.