Dynamical regionalization evaluation for a tropical area

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Due to its geographic location, orography and the effects of adjacent seas, Mexico has a great variety of climates, during summer and autumn, the meteorological events that affect the area, are associated with tropical dynamics (tropical waves, hurricanes and mesoscale convective systems mainly), while during winter the meteorological events are associated with extratropical dynamics (cold fronts). The local response associated with regional atmospheric dynamics is also influenced by low frequency processes, such as seasonal, annual, interannual and decadal fluctuations, contributing to variability and climate change. The reproduction of these complex dynamics by models is a big issue.
The General Circulation Models (MCG) are a useful tool to contribute to the understanding of the global circulation, its resolution is adequate to describe global circulation patterns, however, it is insufficient to describe local processes, such as the effects of abrupt orography or small-scale atmospheric processes within 100 km. A dynamical reduction of scale is required, using regional models at higher spatial resolutions.

To evaluate the capacities of the regional models, RegCM and WRF were forced with ERA-INTERIM Reanalysis and CNRM global model, with a temporal resolution of six hours and spatial resolution of 50 Km. for the historical period 2007-2012. Comparisons between the regional models (WRF and RegCM) were made to the northern and southern Mexican areas. We analyzed the interannual variability, the annual and seasonal cycles, by applying metrics such as bias, mean square error and temporal correlation.

In addition, regional processes such as easterly waves and cold fronts (kinetic energy perturbation), ITCZ (seasonal surface convergence) and North American Monsoon (seasonal precipitation) are analyzed.