Simulation of temperature and precipitation climatology for the CORDEX-MENAArab domain using RegCM4

ABSRACT

The performance of a regional climate model RegCM4.3.4 (RegCM4) in simulating the climate characteristics of the Middle East and North Africa (MENA) region has been evaluated. The simulations carried out in this study contribute to the joint effort by the international regional downscaling community called Coordinated Regional climate Downscaling Experiment (CORDEX). The model has been forced with the boundary conditions obtained from the global reanalysis dataset ERA-Interim for the period 1979–2010. An east–west cold bias is found in the northern part of the MENA domain in RegCM4 that is absent in the ERA-Interim driving forcings, whereas a large warm bias is found over the southern Arabian Peninsula (Yemen/Oman) for both RegCM4 and ERA-Interim. The possible causes leading to the warm bias over Yemen/Oman in the RegCM4 are discussed. The model performed well in capturing the salient features of precipitation which includes ITCZ, Mediterranean cyclones as well as precipitation minima over the deserts. Moreover, the annual cycles of precipitation and mean temperature over the prominent river basins of the region have been ably captured by the model. Temperature-precipitation relationship revealed that the ERA-Interim driving forcings stay closer to the observations; however, RegCM4 remains competent for most of the Koppen-Geiger climate classification types. Performance of the model in capturing the near surface winds and specific humidity is also presented. Based on the results of this study, it is concluded that RegCM4 is well suited to conduct long-term high-resolution climate change projection for the future period over the CORDEX-MENA/Arab domain.