Geophysical Research Abstracts
Vol. 15, EGU2013-3487, 2013
EGU General Assembly 2013

Regional Climate Downscaling Using a High-resolution Global Atmospheric Model

Hamza Kunhu Bangalath, Georgiy Stenchikov, and Sergey Osipov
King Abdullah University of Science and Technology, Thuwal, Saudi Arabia (Georgiy.Stenchikov@kaust.edu.sa)

In this study, we used HIRAM, a high-resolution atmospheric model [Zhao et al., 2009] for climate downscaling with the horizontal grid spacing of 25 km. Our simulations followed the CORDEX protocol [Giorgi et al., 2009] and were conducted for historic (1975-2006) and future (2005-2050) periods using both RCP 4.5 and RCP 8.5 scenarios. Compared with the Geophysical Fluid Dynamics Laboratory (GFDL) AM2.0 and AM2.1 [Delworth et al., 2006], HIRAM uses enhanced vertical discretization on 32 vertical layers instead of 24 and replaces the relaxed Arakawa-Schubert convective closure with the one developed at the University of Washington. The model retains the surface flux, boundary layer, large-scale cloud microphysics, and radiative transfer modules from the AM2 family [Delworth et al., 2006]. HIRAM also employs a cubed-sphere implementation (here at 25-km resolution) of a finite-volume dynamical core and is coupled to LM3, a new land model with ecosystem dynamics and hydrology. In our simulations, the Sea Surface Temperatures (SSTs) from the GFDL Earth System Model runs, ESM2M and ESM2G, performed for the International Panel for Climate Change AR5 project with a latitude-longitude grid of 2°x2.5° were adopted as the bottom boundary conditions over the sea. We used prescribed time-varying greenhouse gas and stratospheric/tropospheric aerosol distribution datasets to reproduce the observed radiative forcing in the model as described by Delworth et al. [2006]. Here, we present results for the CORDEX Middle East and North Africa domain and compared them with the coarse-resolution ESM2M/ESM2G simulations as well as with the nested regional model projections.

Delworth, T. et al. (2006), GFDL's CM2 Global Coupled Models. Part I: Formulation and Simulation Characteristics, J. Climate, 19, 643-674.
Giorgi, F., C. Jones, and G. Asrar (2009), Addressing climate information needs at the regional level: The CORDEX framework. WMO Bull., 58, 175–183
Zhao, M., I. M. Held, S-J. Lin, and G.A. Vecchi (2009), Simulations of Global Hurricane Climatology, Interannual Variability, and Response to Global Warming Using a 50km Resolution GCM, J. Climate, 33, 6653-6678.