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Title:	Representation of Arabian Peninsula summer climate in a regional atmospheric model using spectral nudging
Authors:	Attada, Raju (/jspui/browse?type=author&value=Attada%2C+Raju) Kunchala, Ravi Kumar (/jspui/browse?type=author&value=Kunchala%2C+Ravi+Kumar) Dasari, Hari Prasad (/jspui/browse?type=author&value=Dasari%2C+Hari+Prasad) Sivareddy, Sanikommu (/jspui/browse?type=author&value=Sivareddy%2C+Sanikommu) Yesubabu, Viswanadhapalli (/jspui/browse?type=author&value=Yesubabu%2C+Viswanadhapalli) Knio, Omar (/jspui/browse?type=author&value=Knio%2C+Omar) Hoteit, Ibrahim (/jspui/browse?type=author&value=Hoteit%2C+Ibrahim)
Keywords:	Arabian Peninsula summer climate atmospheric model
Issue Date:	2021
Publisher:	Springer Link
Citation:	Theoretical and Applied Climatology, 145(1-2), 13–30.
Abstract:	This study assesses the performance of the Weather Research and Forecasting (WRF) model in simulating the Arabian Peninsula summer climate for the period 2001–2016. The European Centre for Medium range Weather Forecast (ECMWF) reanalysis is downscaled using WRF without (CTRL) and with the Spectral Nudging (SPN) method. Our results suggest that the noticeable cold biases in surface temperatures (mean, minimum, and maximum) over the Arabian Peninsula in CTRL are significantly reduced in SPN. The seasonal patterns of surface pressure, cloud cover, lower and upper tropospheric circulation, and mid-tropospheric anticyclone are also simulated more realistically with SPN. The evaluation of mean vertical profiles of dynamical and thermo-dynamical features over the Arabian Peninsula further confirms the enhanced simulations with SPN with respect to CTRL. Though SPN captures better the observed evolution of rainfall compared to that of CTRL, it produces a positive rainfall bias over the Southwestern Arabian Peninsula. Stronger vertical motions associated with the local topography enhance the higher water vapor loading, condenses in the upper layers, and results in excess amount of rainfall in SPN. Furthermore, with SPN, WRF is further able to better simulate the synoptic features of heat waves. Overall, SPN enhances WRF simulation skill of the horizontal structures and vertical profiles of the Arabian Peninsula summer climate by enforcing a better balance between the small and large scale features and associated feedbacks.
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