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Evaluation of MM5 and HadGEM3-RA hindcast in the CORDEX East Asia Phase II: near-surface air temperature

Seok-Woo Shin¹, Dong-Hyun Cha¹, Taehyung Kim¹, Gayoung Kim¹, Changyoung Park¹, Minkyu Lee¹, Young-Hwa Byun², and Hyun-Suk Kang³

¹Ulsan National Institute of Science and Technology, Urban and Environmental Engineering, Korea, Republic of (shinsw2012@gmail.com)

²National Institute of Meteorological Sciences, Climate Research Division

³Korea Meteorological Administration, Numerical Modeling Center

Extreme temperature can have a devastating impact on the ecological environment (i.e., human health and crops) and the socioeconomic system. To adapt to and cope with the rapidly changing climate, it is essential to understand the present climate and to estimate the future change in terms of temperature. In this study, we evaluate the characteristics of near-surface air temperature (SAT) simulated by two regional climate models (i.e., MM5 and HadGEM3-RA) over East Asia, focusing on the mean and extreme values. To analyze extreme climate, we used the indices for daily maximum (Tmax) and minimum (Tmin) temperatures among the developed Expert Team on Climate Change Detection and Indices (ETCCDI) indices. In the results of the CORDEX-East Asia phase II, the mean and extreme values of SAT for DJF (JJA) tend to be colder (warmer) than observation data over the East Asian region. In those of CORDEX-East Asia phase II, the mean and extreme values of SAT for DJF and JJA have warmer than those of the CORDEX-East Asia phase II except for those of HadGEM3-RA for DJF. Furthermore, the Extreme Temperature Range (ETR, maximum value of Tmax - minimum value of Tmin) of CORDEX-East Asia phase II data, which are significantly different from those of observation data, are reduced in that of CORDEX-East Asia phase II. Consequently, the high-resolution regional climate models play a role in the improvement of the cold bias having the relatively low-resolution ones. To understand the reasons for the improved and weak points of regional climate models, we investigated the atmospheric field (i.e., flow, air mass, precipitation, and radiation) influencing near-surface air temperature. Model performances for SAT over East Asia were influenced by the expansion of the western North Pacific subtropical high and the location of convective precipitation in JJA and by the contraction of the Siberian high, the spatial distribution of snowfall and associated upwelling longwave radiation in DJF.