Geophysical Research Abstracts
Vol. 19, EGU2017-11110, 2017
EGU General Assembly 2017

Regional climate change over South Korea projected by the HadGEM2-AO and WRF model chain under RCP emission scenarios

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This study assesses the regional climate projection newly projected within the framework of the national downscaling project in South Korea. The fine-scale climate information (12.5 km) is produced by dynamical downscaling of the HadGEM2-AO global projections forced by the representative concentration pathway (RCP4.5 and 8.5) scenarios using the Weather Research and Forecasting (WRF) modeling system. Changes in temperature and precipitation in terms of long-term trends, daily characteristics and extremes are presented by comparing two 30 yr periods (2041−2070 vs. 2071−2100). The temperature increase presents a relevant trend, but the degree of warming varies in different periods and emission scenarios. While the temperature distribution from the RCP8.5 projection is continuously shifted toward warmer conditions by the end of the 21st century, the RCP4.5 projection appears to stabilize warming in accordance with emission forcing. This shift in distribution directly affects the magnitude of extremes, which enhances extreme hot days but reduces extreme cold days. Precipitation changes, however, do not respond monotonically to emission forcing, as they exhibit less sensitivity to different emission scenarios. An enhancement of high intensity precipitation and a reduction of weak intensity precipitation are discernible, implying an intensified hydrologic cycle. Changes in return levels of annual maximum precipitation suggest an increased probability of extreme precipitation with 20 yr and 50 yr return periods.
Acknowledgement : This work was funded by the Korea Meteorological Administration Research and Development Program under grant KMIPA 2015-2081