EMS Annual Meeting Abstracts
Vol. 15, EMS2018-215, 2018

Amplification of heat stress in South Korea due to global warming Based on Multi-RCM Ensemble Projections

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In this study, the future changes in summer (June–July–August; JJA) heat stress over South Korea under global warming are assessed. To better resolve the region-specific changes in terms of geographical patterns and severity of heat stress in the Korean peninsula, four regional climate models (RCMs) are used for dynamical downscaling of Hadley Centre Global Environmental Model version 2—Atmosphere and Ocean global projections forced by two Representative Concentration Pathway (RCP4.5 and RCP8.5) scenarios. Dynamically downscaled simulations (horizontal resolution of 12.5 km and output interval of 3 h) facilitate in-depth analysis of diurnal variation and extremes over South Korea, as well as focusing on the particular location, Daegu, that is characterized by high vulnerability to rising temperature. Both maximum temperature and heat stress indices such as wet bulb globe temperature and apparent temperature, which include the effect of humidity, are examined in order to comprehensively interpret the behaviors of heat stress in response to anthropogenic climate change. Ensemble projections reveal robust patterns of temperature and resultant humidity increases that are roughly constrained by the approximate 7%/K increase in the moisture holding capacity. The changes in temperature and humidity are directly transmitted to the heat stress indices, showing a significant increase. The heat stress is exacerbated in a differentiated way, with more intensification in diurnal variation at nighttime and in regional variation at low-elevation basins. Both RCP4.5 and RCP8.5 scenarios project the statistical likelihood of a notable increase of extreme heat stress indices, much stronger and more extended heat waves, and the emergence of a long period of consecutive tropical nights.

Acknowledgements: This work was funded by the Korea Meteorological Administration Research and Development Program under Grant KMI2018-01213.

Reference: Im, E.-S., Choi, Y.-W., & Ahn, J.-B. (2017). Worsening of heat stress due to global warming in South Korea based on multi-RCM ensemble projections. Journal of Geophysical Research: Atmospheres, 122, 11444–11461.