

Future projection of extreme precipitation by using CMIP6 ensemble data downscaled at finer scales over South Korea

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Extreme climates tend to increase in size and frequency as a result of climate change. Extreme precipitation is one of the most important variables as the impact on infrastructure, such as causing flooding, is significant. Designing a water infrastructure requires rainfall information such as intensity, magnitude, and frequency, which is usually extracted from intensity-sustainable-frequency (IDF) curves. Currently, IDF curves have been created using historical data with stationary assumption that refers to no change in the future, but it is necessary to update the IDF curves based on future climate change scenarios and assess changes in future periods. Recently, Phase 6 of the Coupled Model Inter-comparison Project (CMIP6) released an updated version of the climate models and a daily future precipitation time series for new emission scenarios. We downscaled this data for 40 regions in South Korea and then investigated future extreme precipitation changes. A 100 ensemble of 30-years hourly time series generated by a stochastic weather generator was employed to extract annual maximum precipitation series. Generalized Extreme Value distribution associated with probability weighted moment for parameter distribution was selected to fit data based on goodness of fit tests (i.e., Anderson-Darling (AD) test and Kolmogorov-Smirnov (KS) test). The key results of this study include: (1) the rainfall intensity will increase in the future; the increasing of the rainfall intensity is significantly observed at the end period; (2) the future change of rainfall intensity at hourly scale is more significant than that of daily scale; (3) an ensemble of rainfall intensity should be used to quantify the real value of rainfall intensity in case of short range data; (4) climate internal variability and tail behavior of probability distribution result in uncertainty in estimating rainfall intensity, especially for less frequent storm events; (5) spatial distribution of locations with high and low rainfall intensity has been identified.

Acknowledgment:

This research was supported by the Water Management Research Program funded by Ministry of Environment of Korean government (127554) and by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (NRF-2019R1C1C1004833).

Keywords: CMIP6, extreme precipitation, frequency analysis, future projection