EGU22-11883
https://doi.org/10.5194/egusphere-egu22-11883
EGU General Assembly 2022

Selection of CMIP6 Global Climate Models for long-term hydrological projections

Huong Nguyen Thi[1], Ho-Jun Kim[2], Min-Kyu Jung[3], and Hyun-Han Kwon[4]
[1]Department of Civil and Environmental Engineering, Sejong University, Seoul, Republic of Korea (E-mail: huong@sju.ac.kr)
[2]Department of Civil and Environmental Engineering, Sejong University, Seoul, Republic of Korea (E-mail: khj0215@sju.ac.kr)
[3]Department of Civil and Environmental Engineering, Sejong University, Seoul, Republic of Korea (E-mail: jmk856@sju.ac.kr)
[4]Department of Civil and Environmental Engineering, Sejong University, Seoul, Republic of Korea (hkwon@sejong.ac.kr)

Selection of a suitable Global Climate Model (GCM) in hydrological research for basin-scale of monsoon affected regions under future climate projection scenarios is a great necessity. This study comprehensively evaluated the suitability of 25 available GCMs issued of Coupled Model Intercomparison Project 6 (CMIP6) to choose the best performing GCMs in precipitation simulating skill over the whole main River Basin System in South Korea for the historical period of 1973–2014. Bilinear interpolation method was used for mapping the grid resolution of the simulated GCMs precipitation and observed precipitation with a 0.125^0 x 0.125^0 resolution. Where, the observed monthly precipitation at 56 automated weather stations from 1973 to 2014 were derived from the Korea Meteorological Administration (KMA). Multi-Criteria Decision Making (MCDM) approach based on four spatial metrics, Cramer's V, Goodman-Kruskal (GK) Lambda, Mapcurves and TheilU were proposed to compare the simulated GCMs precipitation with the observed precipitation. To calculate the overall ranking of the GCMs and identify the best performing GCMs, this study applied Jenks Natural Break classification based on the Compromise Programming index. The results indicated that: 1) The GCMs performance was different with different spatial indices with the most suitable of GCMs ranking for each watershed. 2) The best performing GCMs well simulated the annual mean precipitation with a bias of less than 15% for southwestern watersheds and higher biases (30-50%) for remaining watersheds. 3) Majority of CMIP6 GCMs could be capture trends and the spatial distribution of annual, seasonal precipitation over South Korea. However, the result was also found that most GCMs underestimated summer precipitation and overestimated spring precipitation. Therefore, the selected GCMs with corrected biases can be usefully employed for analyzing future changes of hydrological pattern associated with climate change projections.

Keywords: Global Climate Models (GCMs), CMIP6, Bilinear interpolation, Multi-Criteria Decision Making, Jenks Natural Break classification.