Climate Change Impact Assessment for Small Basins with 10-min Precipitation.

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(a) Purpose of study or research hypothesis

Finer temporal scale data of precipitation is required for assessing the impact of climate change on floods, especially in small-size urban and mountainous watersheds vulnerable to floods. For small-size basins, fine scale input data, such as hourly and sub-hourly data, are required and such basins are numerous. Such basins often contain either a developed city or mountain, that is highly vulnerable to flooding.

(b) Key issue(s) or problem(s) addressed

The assessment of impact of climate change on floods is a critical concern in the Jinju basin and to mitigate the impact guidelines for the design of hydraulic and hydrologic structures and flood warning systems needed to be upgraded according to the future climate scenarios. Also, the concentration time of outflow from the urban and mountainous areas in Jinju is less than an hour. Therefore, sub-hourly data (specifically, P10M data) is needed or assessing the climate change impact on floods in the region.

(c) Methodology or approach used

In this study, NTD based on KNNR and GA and Population-based NTD model(PNTD) were used. The procedure of the PNTD model is consists of the following steps: (1) Extraction of precipitation events (E) including dry spells (DS) and wet spells (WS) as well as their accumulated precipitation amounts, called Precipitation Event Extraction (PEE); (2) generation of M-day pseudo-population with the extracted precipitation events, called M-day Pseudo-population Generating Algorithm (MPGA); and (3) downscaling of the target M-day daily precipitation data with the stored M-day pseudo-population using the NTD method instead of observations. In the study, the PNTD model was enhanced to downscale daily precipitation data to P10M.

(d) Results or conclusions derived from the project

Results indicated that the enhanced PNTD model reproduced the key statistics of the P10M data and the statistical characteristics of extreme events represented by the annual maximum precipitation (AMP) series with different durations. Also, the daily precipitation of 19 ESMs with the base and future scenarios, called shared socio-economic pathways (SSPs), for 245 and 585 conditions were applied and downscaled to P10M data. The P10M data can be employed for deriving intensity-duration-frequency (IDF) curves needed for designing urban drainage systems and for installing flood warning systems.

(e) Implications of the project relevant to congress themes

The current study proposed an enhancement of the temporal downscaling of ESM daily precipitation to P10M data for a small basin. The downscaled P10M data can also be employed in assessing how flood characteristics can change according to future climate scenarios.

Keywords : Climate Change, Daily Precipitation, Extreme Events, 10minute Precipitation, RCP, Temporal Downscaling