Flood Frequency Analysis with the consideration of the heterogeneous impacts from TC and non-TC rainfalls: application to daily flows in the Nam River Basin, South Korea

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Abstract

Varying dominant processes, including Tropical Cyclone (TC) and non-TC rainfall events, have been known to drive the occurrence of precipitation in South Korea. With the changes in the pattern of the Earth's climate due to anthropogenic activities, nonstationarity or changes in the magnitude and frequency of these dominant processes have been separately observed for the past decades and are expected to continue in the coming years. These changes often cause unprecedented hydrologic events such as extreme flooding which pose a greater risk to the society.

This study aims to take into account a more reliable future climate condition with two dominant processes. Diverse statistical models including the hidden markov chain, K-nearest neighbor algorithm, and quantile mappings are utilized to mimic future rainfall events based on the recorded historical data with the consideration of the varying effects of TC and non-TC events. The data generated is then utilized to the hydrologic model to conduct a flood frequency analysis. Results in this study emphasize the need to consider the nonstationarity of design rainfalls to fully grasp the degree of future flooding events when designing urban water infrastructures.

Keywords : Tropical Cyclone, Flood Frequency Analysis, Nam River Basin, Climate Change

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