Assessing the variability of climate indices and the role of climate variables in Chungcheong provinces of South Korea

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Abstract

The frequency of natural disasters, including floods and drought events, driven by climate change has increased in recent times. Investigating the climate regimes and the roles of climate variables are indispensable to forestall future climate change related disasters.

This study compares the variability of two popular and widely used climate indices i.e., the United Nations Environment Programme (UNEP) aridity index and the Modified De-Martonne (MDM) index to assess the trend of climate change in the Chungcheong provinces of South Korea. The trend of annual and monthly climate indices was conducted using a non-parametric Mann-Kendall test and Kolmogorov-Smirnov normality test with daily climate data of 48 years (1978-2020) from 10 synoptic stations. The findings indicate that UNEP and MDM indices had a wet climate regime for the annual trend, with the UNEP index indicating a relatively humid trend of 60% humid, 20% semi-arid, and 10% sub-humid for the 48-years study period. However, the MDM index showed a high frequency of a severe wet climatic condition followed by the semi-arid condition. The months of July and August had the highest occurring frequency of the wet climatic condition (90%) for both UNEP and MDM indices. Comparing the two provinces, Chungnam showed a relatively wetter climatic condition using the UNEP index, while the MDM index indicated no significant regional difference in climate regime between the two provinces. The Kolmogorov-Smirnov normality test showed that all the 10 stations are normally distributed for monthly climate conditions at a 5% significant level in the two provinces except five stations for UNEP index and four stations for MDM index in the month of January.

Keywords : Trend analysis, Climate variability, UNEP aridity index, Modified De-Martonne index

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