Evaluation performance of machine learning in merging multiple satellite-based precipitation with gauge observation data

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Abstract

Precipitation plays an essential role in water resources management and disaster prevention. Therefore, the understanding related to spatiotemporal characteristics of rainfall is necessary. Nowadays, highly accurate precipitation is mainly obtained from gauge observation systems. However, the density of gauge stations is a sparse and uneven distribution in mountainous areas. With the proliferation of technology, satellite-based precipitation sources are becoming increasingly common and can provide rainfall information in regions with complex topography. Nevertheless, satellite-based data is that it still remains uncertain. To overcome the above limitation, this study aims to take the strengthens of machine learning to generate a new reanalysis of precipitation data by fusion of multiple satellite precipitation products (SPPs) with gauge observation data. Several machine learning algorithms (i.e., Random Forest, Support Vector Regression, and Artificial Neural Network) have been adopted. To investigate the robustness of the new reanalysis product, observed data were collected to evaluate the accuracy of the products through Kling-Gupta efficiency (KGE), probability of detection (POD), false alarm rate (FAR), and critical success index (CSI). As a result, the new precipitation generated through the machine learning model showed higher accuracy than original satellite rainfall products, and its spatiotemporal variability was better reflected than others. Thus, reanalysis of satellite precipitation product based on machine learning can be useful source input data for hydrological simulations in ungauged river basins.

Keywords : Merging, Random Forest, Machine Learning, Satellite-based Precipitation

Acknowledgment

This work was supported by the National Research Foundation of Korea(NRF) grant funded by the Korea government(MSIT) (No. 2020R1A2C1102758).

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