

# Merging Multiple Satellite Precipitation Products in Korea by using Random Forest Model

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## (a) Purpose of study or research hypothesis

Precipitation is the key component in hydrology and atmosphere cycles. The low density, as well as uneven distribution of the precipitation stations, are the main reasons for the difficulty in collecting high precision rainfall data for analyzing the spatial and temporal of precipitation. Recently, although, satellite-based precipitation products (SPPs) have been recognized as a reliable data source and can be used as input data for researches in water resource management in general and hydrology in particular. However, the accuracy of SPPs is still not high and contains many uncertainties. Enhancement of precision and minimizing the errors of SPPs is essential before it can be applied for further studies.

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

In this study, to exploit the strengths of each SPP, a machine learning model was constructed to obtain a new product not only shows good performance in detecting rainfall events but also has high accuracy in rainfall intensity estimation. The daily of five SPPs including TRMM Multi-satellite Precipitation Analysis (TMPA), the Integrated Multi-satellitE Retrievals of GPM (Global Precipitation Measurement) (IMERGE), the Multi-Source Weighted-Ensemble Precipitation (MSWEP), the Climate Hazards group Infrared Precipitation with Stations version 2.0 (CHIRPSv2) and Global Satellite Mapping of Precipitation (GSMaP) in Korea were chosen as a case study.

## (c) Methodology or approach used

Random Forest (RF) model, which was built based on a large of decision trees was applied for merging multiple satellite precipitation products. By using some continuous and categorical metrics, the efficiency of RF was demonstrated in the evaluation process with rainfall observation data and merging products from another method.

## (d) Results or conclusions derived from the project

The final product achieved from the RF model shows good performance when it was compared with observation data as well as with original satellite precipitation data. Through results obtained in this study, RF proves to be a robust method for enhancement the rainfall estimated from multiple satellite products.

## (e) Implications of the project relevant to congress themes

A robustness method for merging multiple satellite products data was conducted in this study. The result of this approach can be utilized in further studies to deal with various problems in the water resources sector.

**Keywords** : Random Forest (RF), Satellite-based precipitation products (SPPs), Machine Learning (ML)