CASE STUDY-BASED VALIDATION AND PERFORMANCE ANALYSIS OF HSAF PRECIPITATION PRODUCTS OVER TÜRKIYE

Ahmet Öztopal[1], Abdurrahman Durmaz[1], Melek Akın[1], Ahmet Emre Tekeli[2]

[1]Istanbul Technical University, Department of Climate Science and Meteorological Engineering, Istanbul, Türkiye
[2]Iğdır University, Department of Civil Engineering, Iğdır, Türkiye

oztopal@itu.edu.tr, durmazab17@itu.edu.tr, akinm@tu.edu.tr, aemre.tekeli@igdir.edu.tr

Abstract

In the present day, where hydro-meteorological extremes (extreme precipitation, flash floods, and inundations) are progressively increasing due to Global Climate Change, monitoring the spatial and temporal distribution of precipitation with high accuracy is vital for early warning systems and water management. Due to the irregular distribution and physical constraints of ground observation stations, precipitation cannot be monitored with the desired temporal and spatial precision. Satellite-based remote sensing data play a critical role in filling this gap. This study aims to evaluate the performance of operational precipitation products generated by the Support to Operational Hydrology and Water Management (HSAF) under EUMETSAT across the complex topography of Türkiye using a case study-based approach.

Within the scope of the study, extreme precipitation events and convective systems occurring in different geographical regions of Türkiye will be closely examined. High-resolution (hourly/daily) precipitation data obtained from the automated weather observation stations (AWOS) within the network of the Turkish State Meteorological Service (TSMS) will be used as a reference for the validation process. The analyses aim to measure the agreement between satellite-derived precipitation estimates and ground observations using statistical metrics (RMSE, MAE, CC, etc.). Furthermore, the ability of satellite products to detect the presence of precipitation will be tested using categorical performance indicators (FAR, POD, CSI, etc.).

Case study-based investigations will reveal not only the success of satellite algorithms in long-term averages but also their sensitivity and systematic errors (overestimation/underestimation) in extreme values such as rapidly developing orographic precipitation and heavy downpours. The results obtained are expected to provide an up-to-date dataset on the reliability of HSAF precipitation products over Türkiye, contribute to the regional calibration processes of the algorithms, and clarify the potential use of satellite data in flood risk management strategies. This study will offer an academic perspective on the effectiveness of remote sensing technologies in enhancing Türkiye's hydro-meteorological monitoring capacity.

Keywords: EUMETSAT, HSAF, Precipitation Products, Case Study Analysis, Validation, Türkiye.