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An Artificial Intelligence–Based Blending of Satellite products across Mediterranean Island of Sicily, Italy using GPM-IMERG V06 Final Run

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Precipitation is the key input variable to hydrological models and its monitoring plays a significant role in water resources planning and improving flood and drought forecasting, also under climate change impacts. In recent years, many precipitation satellite products have been developed and released to the public; among these, the Integrated Multi-satellitE Retrievals from Global Precipitation Measurement (IMERG) is designed to address limitations and uncertainties related to traditional methods.

The primary purpose of this study is to provide a comprehensive assessment of precipitation estimates retrieved from the IMERG v6 Final Run over the Mediterranean island of Sicily (Italy) at daily and half-hourly temporal and at 0.1° spatial resolution for the first time using a quality-controlled sub-hourly gauge dataset. Sicily, which is characterized by a Mediterranean climate and a complex orography, experiences rather frequent short duration and high intensity precipitation originating from the interaction of steep orography on the coasts with winds carrying humid air masses from the Mediterranean Sea.

Previous studies have highlighted that most of the available satellite-based precipitation products show poor performance for capturing rainfall events at high temporal resolution particularly in coastal areas. Based on these findings, there is a critical need to put much effort to improve retrieval algorithms to account for coastal and morphological effects, thus enhancing satellite-based precipitation estimations for those areas. With this regard, this work also aims to show that a combination of multiple products may result in more accurate estimations especially for short duration events. This merging technique, which has been carried out exploiting artificial intelligence (AI) techniques, is shown to successfully reduce the error based on the comparison with data from a local rain gauge network. The results of the study will demonstrate the proficiency of the AI based approaches for improving remote-sensed daily and sub-hourly rainfall products even in coastal areas with complex orography.