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Blending satellite and ground precipitation observations using geostatistics and machine learning

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Rainfall observations are useful for water resources, flood and drought management studies. However, monitoring stations are sparse in regions with complicated terrain, clustered in valleys, and often of poor quality. Subsequently, the spatial extent of rainfall distribution is frequently represented incorrectly. Satellite rainfall data are an attractive alternative to rainfall observations. Usually, though, they present inconsistencies due to the complexity of the retrieval algorithms and/or the presence of obstacles that affect the infrared observation capability. This work presents a methodology that combines satellite and ground rainfall observations for the improvement of spatiotemporal mapping and analysis. The methodology is based on geostatistical and machine learning principles extended to the Bayesian framework. The case study is the island of Crete, Greece, during the period 2008–2018. Rainfall data from over 50 stations were used in combination with satellite images for the reference period. The results were compared with the outcome of Regional Climate Models for the study area.