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Evaluation and comparison of satellite precipitation estimates with reference to a local area in the Mediterranean Sea

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Precipitation measurement is a key activity for the analysis of storm processes as well as every hydrological process. Satellite retrieval systems, rain-gauge network and radar systems are complement to each other in terms of their coverage and capability of monitoring precipitation. Satellite rainfall estimates systems produce data with global coverage that can provide information in areas for which data from other sources are unavailable. Without referring to ground measurement, satellite-based estimates can be bias. Although some gauged adjusted satellite precipitation products are developed, an effective way of integrating multi-sources of precipitation information is still a challenge.

In this study we select a specific area in Sicily (Italy) having high density rain gauges to evaluate of satellite precipitation products. Sicily has an area of 26,000 km^2 and the gauge density of the network considered in this study is about 250 km^2/gauge. It is an island in the Mediterranean sea with a particular climatology and morphology, which is considered as an interesting test site for satellite precipitation products on the European mid-latitude area. Three satellite products (CMORPH, PERSIANN, TRMM_3B42) along with two adjusted products (TRMM_3B42RT and PERSIANN Adjusted) have been selected for the evaluation. Evaluation and comparisons between selected products is performed with reference to the data provided by the gauge network of Sicily and using statistical and visualization tools. Considerations about differences between the point estimation given by gauges and the gridded surface provided by satellites are discussed as well as the difference between an evaluation based on point estimation and an evaluation based on interpolated data. An analysis of typical interpolation methods used for hydrometerological purposes has been done to choose the most appropriate method considering size of grid satellite data and the density of gauge network. Finally natural neighbor interpolation procedure was adopted to obtain gridded surface data with the same resolution of satellite products. Results show that bias is considerable for all satellite products and climatic considerations are reported to address this issue along with an overall analysis of the PMW retrieval algorithm performance.