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Validation of satellite-derived rainfall products with rain gauges in Serbia

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Four widely available satellite-based rainfall estimates (SRFE) were extensively validated and intercompared on daily, monthly and seasonal timescales, for a 10-year period (2001–2010), using fifteen rainfall stations in Serbia. The evaluated satellite products were divided into two groups according to data latency. The first group, near real-time products, included the Tropical Rainfall Measuring Mission (TRMM) Multi-Satellite Precipitation Analysis (TMPA) real-time product 3B42RT and the Precipitation Estimation from Remotely Sensed Information using Artificial Neural Networks (PERSIANN). The second group, post real-time products, included the TRMM 3B42 research product and the NOAA/Climate Prediction Center (CPC) morphing technique (CMORPH). All satellite products were available at 0.25 degree spatial resolution and daily temporal resolution, further aggregated into monthly and seasonal.
Fifteen rain gauge stations throughout Serbia, operated by the Republic Hydrometeorological Service of Serbia, with available and reliable daily rainfall data for the time period 2001-2010 were selected for this study.
The performance of different satellite-based rainfall estimation (SRFE) products was assessed using standard statistical methods to summarize the strength of the relationship between daily SRFE values and their corresponding ground observations, including the root mean square error (RMSE), correlation coeffient r, BIAS and Nash-Sutcliffe coefficient of daily, 10-day and monthly rainfall, and visual comparison methods. The results demonstrate that all evaluated products have significantly lower accuracy during the winter months (December to February) and highest accuracy in autumn months (September and October). In respect to performance, the TRMM research product showed best results overall, followed by the CMORPH and TRMM-RT realtime product. PERSIANN showed generally lower accuracy, except in the autumn season.