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Improving satellite quantitative precipitation estimates through the use of high-resolution numerical weather predictions: Similarities and contrasts between the Alps and Blue Nile region

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Estimation of heavy precipitation events (HPEs) over high mountainous terrain is a particularly challenging task due to the limited availability of in-situ observations. Proper analysis and thorough understanding of the charac-teristics of HPE over complex terrain is thus hampered by insufficient precipitation information. Rain gauge networks usually present insufficient density and quality control issues in such areas. Radar rainfall estimates, wherever available, are heavily affected from terrain blockage. In this context, remote sensing has been attributed with a major role. However, this does not come without blemishes, as strong underestimation of precipitation associated with low-level orographic enhancement, introduces significant error in satellite estimates.

In this study, we evaluate a satellite precipitation error-correction approach that can be implemented in the ab-sence of ground observations and it is based on utilization of precipitation information from high-resolution (1-2km) NWP simulations. Two quasi-global satellite precipitation products (CMORPH-8km and PERSIANN-4km) are used in more than 20 identified HPEs over two mountainous areas, the Alps and Ethiopia's Blue Nile. High-resolution atmospheric simulations from RAMS/ICLAMS are evaluated against rain gauge networks and radar estimates, then utilized to derive error correction functions for corresponding satellite precipitation data. Consequently, a PDF matching is applied and conclusions on the dependence of the method from synoptic at-mospheric conditions, which reveal to a certain degree the predictability of error properties, as well as the possi-bility of a global approach, are thoroughly discussed.