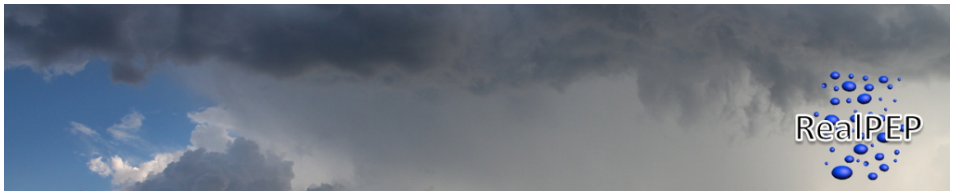

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Assessing the benefits of specific attenuation for quantitative precipitation estimation with a C-band radar network

Monday, October 5, 2020 3:05 PM (20 minutes)

Recent advances have been made to demonstrate the benefits of radar-derived horizontal specific attenuation (AH) for Quantitative Precipitation Estimation (QPE) at S and X band, however, to date the methodology has not been adapted and optimized for C-band radars in widespread use in Europe. Simulations based on a large dataset of Drop Size Distributions (DSDs) measured in Germany are performed to investigate the DSD dependencies of the attenuation parameter αH, mandatory to first derive AH. The normalized raindrop concentration (Nw) and the slope of differential reflectivity (ZDR) versus reflectivity (ZH) are used to categorize radar observations and corresponding optimized αH are applied. For heavier continental rain dominated by large raindrops originating from hail or contaminated with hail, the R(AH) algorithm is further combined with the rainfall retrieved from proxy specific differential phase R(KDP*). Also, the performance of retrievals based on vertical specific attenuation R(AV) are tested. Finally, the adapted hybrid QPE algorithms are applied to five diverse case study days monitored by the nation-wide C-band radar network in Germany and compared to rain gauge measurements and the operational German RAdar-OnLine-ANeichung (RADOLAN) RW product, which is based on reflectivities only but adjusted to rain gauges. Rainfall retrievals using AH/V with optimized αH/V combined with R(KDP*) show a smaller bias and outperform traditional R(Z) algorithms when evaluated via rain gauges. Moreover, R(AH/V)-based algorithms are consistent with the RW product and additionally bear the advantage of immunity to the partial beam blockage. An optimization of net αH/V along the radial or within a segment is suggested for future work.

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