

## **Have we reached the limits in quantitative precipitation estimation by conventional weather radar?**

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Over the last decades weather radars have been used to obtain real-time information on observed precipitation systems. Unfortunately, weather radar measurements are affected by multiple sources of error. Numerous approaches have been developed to improve the quality of the radar precipitation product by correcting the estimates using the volumetric information or applying additional information obtained by in situ rain gauge and disdrometer observations. Even though such studies lead to a clear improvement in the quality of the weather radar precipitation measurements, their impact is highly uncertain and changes between different precipitation events. To further improve the capabilities of the weather radar many meteorological services have already upgraded or will soon upgrade

the operational weather radar to additionally obtain polarimetric reflectivity information. Does this mean that the conventional volumetric weather radars have reached their potential? Or are there still possibilities to further improve the quality of these devices using approaches that for the future might also be of interest for polarimetric weather radars correction algorithms?

We feel that the full hydrological potential of weather radar has not been reached yet. So far, operationally only limited use is made of the full volumetric information sampled by the weather radar. Historically, computational constraints hampered the possibility of using of this information. However, nowadays such constraints are almost gone. In the current work we will present some of our thoughts on how to further extend the precipitation estimation capabilities of volumetric weather radars by: 1) using precipitation region identification approaches to improve VPR estimates, 2) implementing these approaches in operational correction algorithms, 3) linking surface disdrometer observations to spatial and temporal changes in the volumetric reflectivity field, 4) identifying weather radar precipitation uncertainty, and 5) reducing the impact of Z-R variability by making use of effective different drop size distribution parameter relations.