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Recent improvements of CML rainfall estimation and CML-Radar combination in Germany

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During the last years we made great progress with the country-wide rainfall estimation from commerical microwave link (CML) data in Germany (Graf et al. 2020, Polz et al. 2020). Using the derived results in different applications has, however, revealed that undetected erratic behaviour of CML raw data is still limiting data quality and that data gaps during heavy rain can lead to underestimation of peak rain rates. Hence, we have extended our processing methods and, for the first time, have carried out a large-scale intercomparison with other available methods. Albeit we are constantly improving our CML rainfall estimation, we already apply these data to operationally generate rainfall maps for Germany, also in combination with radar data from the German Meteorological Service (DWD).

In this contribution we will present our current research on the following interconnected topics:

1. Detecting erratic signal fluctuations: In contrast to the existing methods that focus on detecting rainy-periods in the noisy raw data we have developed a dedicated classification method for periods with erratic signal fluctuations, which can easily lead to rainfall overestimation from CMLs. Our method, which is based on an artificial neural network, is designed to reduce the number of falsely classified rainy periods during dry periods with strong signal fluctuation.

2. Large scale method intercomparison: For the first time, we compare the widely used RAINLINK algorithm, which is based on analysing data from nearby CMLs, with purely time-series based processing methods. First results show that both methods have advantages that, when combined, could improve the overall processing.

3. The effect and mitigation of data gaps during heavy rainfall: CML networks are designed so that very heavy rain events lead to a complete loss of signal, and hence to gaps in the data we use for rainfall estimation. We analyse the occurrence of these gaps and show the impact on CML-derived rainfall estimation as well as mitigation methods.

4. Real-time application: We use the CML data that we acquire in real-time to generate rainfall maps for Germany and merge the CML rainfall estimates with DWD radar data. Our approach is an

extension of the existing RADOLAN-method. Results show that merging with the path-averaged CML rainfall information provides similar results than merging with gauges. In regions where the addition of CMLs significantly increases the density of observations, the joint Radar-gauge-CML product is expected to show improved quality.

References:

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