



Real-time country-wide rainfall derived from a large network of commercial microwave links in Germany

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A large part of the cell phone base stations are interconnected using a network of commercial microwave links (CMLs). These CMLs operate at frequencies typically between 15 GHz and 40 GHz where rainfall considerably attenuates the transmitted signal along the CML paths. Hence, path averaged rain rates can be estimated from attenuation data obtained from the CMLs. Over the last years, this technique has already proven to provide valuable rainfall information, showing good performance when validated via gauge adjusted radar data. Rainfall observations, however, are most useful if they are available with short temporal delay, since only then they can be used to trigger warnings regarding flooding. In particular in small catchments or urban environment which quickly react to strong rainfall input, a delay of one hour is already too long.

We process more than 4000 CMLs all over Germany in real-time, based on instantaneous records which we acquire every minute. The data is ingested into our processing pipeline within seconds and processed to rainfall information. This processing includes outlier detection, wet/dry classification, compensation for wet antenna attenuation and temporal aggregation. Every five minutes we generate a rainfall field from the processed CML data for Germany and update a web-based visualization of this rainfall data.

We describe our data acquisition and management system. We elaborate on processing challenges and our processing methods, in particular the necessary tradeoffs for real-time processing. Finally we will do a live demonstration of our new web-based visualization of the CML-derived rainfall information for Germany and show a validation for the period from August 2017 till April 2018 using RADOLAN, the rain gauge adjusted radar product of DWD.