Czech-German transboundary rainfall fields generated from two independent networks of commercial microwave links

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The main advantages of commercial microwave links (CMLs) as opportunistic rainfall sensors are their availability even in sparsely gauged regions and their close-to-ground rainfall observations. Moreover, the observations are accessible with a delay of only several seconds within cellular telecommunication networks. However, this access is in practice constrained by legal and administrative burdens. CML rainfall research suffers from this general limitation and proposed methods have thus not been developed and evaluated for different datasets across the boundaries of institutions and countries (Chwala and Kunstmann, 2019). Due to the fact that CML data is typically acquired on a national level and not openly shared, the exchange of data, the cross-validation of methods and transboundary applications of CML data have not been realized up until now.

In the proposed study we process large CML data sets from Germany and the Czech Republic and, for the first time, generate transboundary rainfall maps. We work with unique data sets from two independent data acquisition systems which are successfully merged into one rainfall product. The CML product covers the whole of Germany and the western part of Czech Republic including border mountain regions where radar products are affected by ground clutter and rain gauge networks are sparse. We analyze 1-min observations of 4000 CMLs in Germany and 2500 CMLs in the Czech Republic during summer period 2021, which contains periods of heavy rainfalls as well as clear dry-weather intervals. The resulting rainfall maps are compared with gauge and radar observations.

The results of the study provide the evidence that CML rainfall retrieval in transboundary or continental scale is applicable. The generated rainfall maps from opportunistic sensing are of high quality and can be further used for assimilation with other data sources. We also demonstrate that the interoperability of CML data sets is possible which was one of the largest deficits up to today. Generation of transboundary rainfall maps represents an important milestone on a way to the CML-based operational rainfall product at continental scale.

Chwala, C. and Kunstmann, H. (2019) Commercial microwave link networks for rainfall observation: Assessment of the current status and future challenges. WIREs Water. 6:e1337. https://doi.org/10.1002/wat2.1337.