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# Convective cell tracking using commercial microwave link rainfall observations with sub-minute temporal resolution

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Weather radar are able to provide high resolution spatial rainfall products, however, they measure rainfall several hundred meters above ground. Assigning observed rainfall to specific point at ground might be thus challenging, especially due to wind drift of raindrops and beam refraction. Traditional ground observation networks are usually insufficiently dense for quantifying displacement between rainfall field observed by weather radar and rainfall reaching the ground. Commercial microwave links (CMLs) might help in this regard and close the observational gap between radar and ground observations.

Rainfall retrieval from commercial microwave links (CMLs) have been tested extensively within various experiments and case studies during recent decade. CML rainfall retrieval is especially promising for ungauged regions, and cities, where the CML networks are densest; number of CMLs in cities exceeds existing rainfall observations by two orders of magnitude. CMLs rainfall time series usually capture very well rainfall temporal dynamics, however, they are often biased. The bias can be especially high for shorter CMLs, which are sensitive to systematic errors due to wet antenna attenuation. However, even highly biased CMLs might still provide useful information on rainfall space-time patterns and rain cell motion, which could be used for quantifying displacement between rainfall observed by radar several hundred meters above ground and rainfall reaching ground.

This contribution investigates capability of CMLs to track convective rain cells close to ground. The investigation uses virtual CML observations with real topology taken from mobile backhaul network of T-Mobile, CZ in Prague region. Virtual rainfall fields are used to simulate CML path-integrated rainfall observation. These virtual observations are then used to quantify speed and direction of rain cell motion. Finally, convective cell tracking is tested also on real-world CML data recorded with approx. 10 s temporal resolution and compared with C-band weather radar observations having resolution 1 x 1 km2 and 5 min.

Our initial results indicate that even biased CMLs could be useful for close-to-ground tracking of convective cells. This could enable in the future to better link radar and close-to-ground observations and provide basis for improved weather radar adjusting algorithms accounting e.g. for wind drift of raindrops.