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Five years of commercial microwave link network derived rainfall research in Sweden

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Accurate rainfall measurements are very important in hydrology, meteorology, agriculture and other fields. Traditionally rain gauges combined with radar have been used to measure rain rates. However, these instruments are not always available. Also combining point measurements at the ground with measured reflectivities of volumes in the air to an accurate rain rate map at ground level poses challenges. Commercial microwave link networks can help in these areas as these can provide measurements at a high temporal resolution and tend to be available wherever people live, with highest network densities where most people are. They also measure precipitation along a path near ground level and offer a way to close the gap between rain gauge measurements and radar.

In this study we highlight the work SMHI has performed on deriving rain rates from commercial microwave links since 2015. This started with a pilot study in Gothenburg. The signal strengths of 364 microwave links were sampled every ten seconds and were used to create rainfall maps at a one-minute temporal resolution and 500m spatial resolution. These rain maps were then applied in a hydrological experiment and compared to rain gauge and radar measurements. The results were very promising, not only due to the high temporal and spatial resolution, but also with the accuracy of the actual measurements. The correlation was found to be equal to those of the rain gauges, while links were found to overestimate rainfall volumes on average. A demo site was created showing the one-minute rain rate maps and can be found at: <https://www.smhi.se/en/services/professional-services/microweather/>. Since then the methodology has been further improved and also applied within Stockholm in a new hydrological experiment. Currently new regions are being considered, as well as novel ways to merge data sources to create high quality precipitation maps. This contribution summarizes the progress to date.