Response to the comments of reviewer #2:

We thank the reviewer for the valuable comments and the time to carefully examine the manuscript. In the following the comments of the reviewer are in black and our responses are in blue.

The authors present an analysis of rainfall estimation using minutely transmitted-minus-received signal level (TRSL) measurements from almost 4000 commercial microwave links (CMLs), located country-wide in Germany.
The fact that the authors have access to a very large database of minutely TSL/RSL measurements is unique, as, previous studies that presented a country-wide CMLs-based rainfall monitoring used a lower 15-minute sampling rate (and on top of that,some had access to the minimal and the maximal TSL/RSL values rather than the instantaneous values).
The presented rainfall estimation process follows the general steps established previously, including preparation of the data, baseline estimation, rain event detection, wet-antenna attenuation compensation, and rain-retrieval.
The authors compared the CML rain estimation outcome with the radar-based RADOLAN-RW data set, which shows, in general, good agreement.

Even though the presented study is very interesting, and can potentially contribute to this field of research, there are two main concerns that I feel the authors should address:

1. There are many different steps that the are being done in processing the data that include setting up different thresholds and margins (e.g., assuming that 5% of the time is classified as “rain”, different moving-average window durations, different thresholds and percentile values from which the data is omitted, and so on). The problem here,is that there is no discussion regarding the logic behind selecting these specific parameters. It is very easy to “find the best parameters and thresholds” once you have a data-set used as ground-truth (in this case, the RADOLAN - which is later used for comparison). However, it is imperative to understand the actual process behind selecting these specific values, in order for the proposed methodology to be successfully deployed in different locations.
Response: We agree that an understanding of all involved processes is very important and we will make the selection of parameters and thresholds clearer in the methodology section and discuss the decision where necessary. In detail we are going to address the following thresholds and parameters:

- p. 7, l. 11: length of filters to remove noisy data:
  We used two different filters to remove noisy/erratic CMLs for each month. For both filters we use thresholds which are in a range which is too far away from the average CML to make sense. We will explain the specific use of both filters in the revised manuscript more explicitly: With a five-hour moving standard deviation we filter CMLs which either have a very strong diurnal cycle or very noisy periods during a month. The other filter uses the moving window standard deviation approach by Schleiss et al. (2010) with a window length of one hour and a rain event detection threshold of 0.8. This threshold is conservative, meaning it selects only stronger rain events from a typical CML in our data set. When this threshold is exceeded more than one third of the time of a month, the respective CML is considered as too noisy and therefore is excluded from further analysis.
- p. 8, l. 22ff: 5 percent rainfall in Germany
  We took the 5 percent from Schleiß and Berne (2010), for the analyzed period of one year this value is more or less arbitrary because it is climatologic based. Of course, this climatological prerequisite cannot be fulfilled on either temporal or spatial scale but rather is a robust approach and simple way to provide a first rain event detection.
  (see also responses to comment 11 and 12 from Reviewer #1)
- p. 8, l. 33ff: 80th quantile and scaling factor
  The 80th quantile reflects the general amount of fluctuation of a CML without being influenced by the climatology as the threshold from Schleiß and Berne (2010) which explicitly uses the climatology. The scaling factor of q80 was calibrated for May 2018 with the optimal thresholds

derived as explained at p. 8, l. 30ff. We also checked the derived scaling factor for other months and found them to be similar.

- p. 9, l. 25: γ and δ used in the WAA scheme from Leijnse et al. (2008)
  γ and δ are parameters of the logarithmic function of Leijnse et al. (2008)'s WAA model. As the WAA model from Schleiss et al. (2013) suppressed most of the small rain events, we chose γ and δ in a way that for small rain rates the WAA compensation is smaller, while high rain rates are treated with a correction in the same range as in the WAA model from Schleiss et al. (2013).

2. I find it lacking that no comparison with other established approaches of CML-based rain retrieval is being performed or discussed. Furthermore, the authors did not consider newer approaches for the different steps they perform (e.g., the wet-antenna or the baseline retrieval algorithms that are selected are based on algorithms published in 2008, 2010, and 2013, while there are many updated published newer studies. I am not saying that the decision to use the specific selected algorithms is incorrect, but, it should be explained why these specific algorithms are selected, with respect to other approaches that have been presented since.

Response: We will add a comparison to other CML studies as described in the answer to Reviewer 1. Also, we will explain the reasons which led to the selection of the processing steps in more detail in the manuscript e.g. for the WAA we selected a time (Schleiss et al. 2013) and a rain rate (Leijnse et al. 2008) dependent WAA model to compare both of them. The time dependent WAA model suppressed small rain rates too much, which is the reason we chose the rain rate dependent WAA model with certain parameters for γ and δ.

References:

Leijnse, H., Uijlenhoet, R., & Stricker, J. N. M. (2008). Microwave link rainfall estimation: Effects of link length and frequency, temporal sampling, power resolution, and wet antenna attenuation. *Advances in Water Resources*, *31*(11), 1481-1493.

Schleiss, M., & Berne, A. (2010). Identification of dry and rainy periods using telecommunication microwave links. *IEEE Geoscience and Remote Sensing Letters*, *7*(3), 611-615.

Schleiss, M., Rieckermann, J., & Berne, A. (2013). Quantification and modeling of wet-antenna attenuation for commercial microwave links. *IEEE Geoscience and Remote Sensing Letters*, *10*(5), 1195-1199.