Response to the comments of reviewer #3:

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 interesting analysis of rain fall derived from an unique dataset of nearly 4000 CMLs measured at a 1-minute scale.The correspondence with RADOLAN-RW is in general good during summer and less so during winter. This is corresponds well with other studies and theory, but was able to this on a new larger scale than seen before. The study therefore shows the great potential of CMLs, especially in areas where there might be little other data sources available.

The paper is well constructed in general and will contribute to the further development of CML derived rain rates. There are a few points that I would like to see addressed however:

1. The reference dataset is based on gauge-adjusted hourly radar. While this offers the authors a source of data to compare link path derived rain rates with, it does not show the uniqueness of their dataset with a 1-minute resolution. The paper could for example benefit from an additional analysis of CMLs compared to rain gauge data with a high temporal resolution available at the DWD Climate Data Center. This analysis could be further extended by comparing hourly sums of rain gauge data with CML and RADOLAN derived rain rates (even though the RADOLAN data are of course adjusted using these same gauge data). While the rain gauges only offer point measurements, compared to the line measurements of the CMLs and the volumes of the radar it would give additional insight and offer the authors a chance to show the uniqueness of the dataset.

Response: The goal of this study is to show the general performance of CML derived rainfall against a reference on a countrywide scale. We have chosen a spatial rainfall product (RADOLAN-RW) as reference in this study, because it allows us to validate the path-averaged rain rates of the CMLs. For a comparisons to rain gauges we would have to discuss and decide what a suitable maximal distance between CML-path and rain gauge is. Furthermore, with increasing path length, the path-averaged CML-derived rain rate estimates will be smoothed out compared to the point observations of the gauges. Both factors, the questions of distance between CML-path and rain gauge, as well as the effect of path-averaging will be more severe for short temporal aggregations. We have already done tests with the 1-minute rain gauge data from the DWD Climate Data Center and found that, even for the rain gauges in the vicinity of CMLs (gauge max. 2 km from CML-path, resulting in 191 CMLs with such a reference) we have to do temporal averaging to make rain rates comparable. We did not yet look on the effect of CML-path length, but it certainly will have an impact.

In conclusion, we agree that it would be interesting to compare the 1-minute CML-derived rainfall estimates to 1-minute rain gauge data. But since we can only do that in a meaningful way for a small subset of our data (191 CMLs have a gauge within 2km distance) and since it would introduce further uncertainties, we want to keep the existing analysis of this study homogeneous using only one reference dataset. Similarly, we believe it is beyond the scope of this study to compare rain gauge data with RADOLAN. We appreciate the reviewer's suggestion, though, and think it is worth working towards a separate study on the effect of spatio-temporal sampling differences between CML-, radar- and gauge data with high temporal resolution.

2. Like the first referee I think the paper might also benefit of analyzing the data at different thresholds, to show clearly how CMLs perform in at different rain intensities. It would also be good to clearly state how the filtering was performed. Is only a threshold applied to the RADOLAN data and how does this affect the CML data?

Response: We agree with the reviewer that the use of thresholds shows us the performance for different rain intensities. It further will increase the comparability to other studies. We will add this to our analysis as described in the response to Reviewer #1 general comment 1.

Finally a few minor comments:

P1, line 5: add a comma -> one year, spans
Response: We will add the comma.

P2, line 11: this -> these
Response: We will correct the typo.

P2, line 12: remove the space before the.
Response: We will correct the typo.

P2, line 15: add a mention of the often limited spatial resolution of satellites
Response: We will extend the section about satellite products and will elaborate more on the spatial and temporal constraints and the differences between geostationary and satellites in Lower Earth orbits.

P4, line 13: The CML range is mentioned to be over 30km. In figure 2 there do not seem to be any CMLs beyond 30 km.
Response: Indeed, this is a mistake, for the analyzed CML data set, there is no CML longer than 30 km. We will correct the manuscript accordingly.

P6, fig2: The label on the x-axis should read (km) and not (m)
Response: We will correct the typo.

P9, line 24: Are all antennas of the same material and construction?
Response: We currently have access to the CML network of one cellular provider and only to one CML type, the Ericsson MINI-LINK Traffic Node system. Based on the antennas from this network that we have already had in our lab, we can say that there are at least two different types of covers. We took the value of 4.7 mm thickness from an 18 GHz antenna cover made from polycarbonate.

P13, line 34: What is the 30km range based on?
Response: The 30 km range is a compromise. We have several larger gaps in the CML coverage and want to avoid that rainfall fields are generated too far away from the observations. We are aware that for extremely small scale convective events, the spatial decorrelation length for hourly rainfall will be smaller. But we also want to keep the spatial coverage of our CML rainfall field as high as possible. The value of 30 km was found to meet this requirement best. Results from van de Beek et al. (2012), who found the range of semi-variograms to be around 30 km for hourly rainfall in the summer months in the Netherlands, support our decision.

P15, line 5; But -> However
Response: We will correct the typo.

P18, line 10: But -> However
Response: We will correct the typo.

In general the text could benefit from added commas to improve readability.
Response: We will revise the manuscript under this perspective and try to increase the readability.

References:

Van de Beek, C. Z., Leijnse, H., Torfs, P. J. J. F., & Uijlenhoet, R. (2012). Seasonal semi-variance of Dutch rainfall at hourly to daily scales. *Advances in Water Resources*, *45*, 76-85.