

We are pleased that the topic editor has accepted our manuscript for publication in Earth System Science Data with minor corrections. Again, we thank the referees as well as the editor for their valuable work.

Please find below our point-by-point responses to the comments (in italics). We correspondingly revised the manuscript and submitted a new marked-up version showing the changes made (we used latexdiff in LaTeX). Added statements are in blue, whereas the deleted parts are in red with a strikethrough.

While revising the manuscript, we performed a comprehensive language and style check to improve its language, style, and overall readability, as requested by Reviewer #1. We also checked all tables and figures. This revision resulted in many editorial changes, which are highlighted in the marked-up document as well. It is worth mentioning the following changes:

- Introduction: we added a statement on paper organization in the last paragraph
- Table 1: we changed the header of the last column
- Table 2, header: The elevation and azimuth were switched in the previous manuscript version.
- Section 4.2 title: we changed it from the “Analysis of the radar along SML-path based on ERA5 melting layer”, into a more straightforward one: “Effect of the 0°C isotherm height”
- Section 4.3: we reorganized the first paragraph and second paragraphs.

We believe that these revisions have improved the clarity, consistency, and overall scientific style of the manuscript, making it more suitable for publication.

Reply to Reviewer #1

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Review #1

The manuscript is generally well written. The dataset is comprehensively documented and appears fully compliant with FAIR principles. The authors provide metadata, quality-control information, and supporting observations.

We recommend acceptance after minor revisions, mainly concerning: clarification of methodological choices, discussion of dataset limitations and uncertainties, and correction of a small number of editorial and typographical issues.

Suggestions for revision or reasons for rejection

(visible to the public if the article is accepted and published)

The manuscript introduces OpenSat4Weather, the first large-scale open-access dataset of satellite microwave link (SML) observations for precipitation monitoring. The dataset is well documented, scientifically valuable, and highly relevant for the hydrometeorological and opportunistic sensing communities. The inclusion of concurrent rain-gauge, radar, and ERA5-derived products significantly enhances its usefulness for algorithm development and validation.

We recommend publication after minor revisions.

Major comments:

1. The manuscript would benefit from a more explicit discussion of uncertainties associated with the auxiliary datasets, e.e., the limitations of using ERA5 0°C isotherm heights at 0.25° spatial resolution and the uncertainty introduced when deriving radar rainfall estimates along the SML path.

Reply: Regarding ERA5, the 0°C isotherm height has some uncertainty arising from the model's spatial resolution (0.25°), which is particularly relevant in mountainous regions where the topography cannot be fully resolved. Previous studies suggest that ERA5 can exhibit systematic errors in freezing-level height over complex terrain due to these resolution limitations (<https://doi.org/10.3389/feart.2022.875795>). Furthermore, comparisons with aircraft observations indicate that ERA5 atmospheric temperatures are generally accurate, with maximum biases of approximately 0.4 K at upper levels over the North Atlantic, while direct comparisons of ERA5-derived 0°C isotherm heights with aircraft measurements in Chile reported mean absolute errors of approximately 133–245 m (<https://doi.org/10.5194/acp-25-157-2025> & <https://doi.org/10.1002/joc.70229>).

As the RSL from SMLs is attenuated mainly from rain present along its slanted path through the atmosphere, we consider radar-derived rainfall intensity data interpolated along the SMLs path as a well suited reference. We used the Meteo France analysis product named “Panthere”, which consists of a radar composite and not individual volume scans. Radar data is of course prone to a variety of uncertainties and error sources due to their indirect measurement above ground, but the adjustment to ground sensors implemented in Panthere is reducing this uncertainty a bit.

We added a paragraph describing the uncertainties in ERA5 0°C isotherm height data at the end of Sec. 2.4 “ERA5”. We also added two final statements on radar uncertainties at the end of Sec. 2.3 “Weather Radar” (the new text starts with: “Although gauge-based adjustment ... “)

2. The dataset covers only five months (August–December 2022). While this period includes a variety of rainfall conditions, the manuscript should explicitly discuss potential limitations related to seasonal representativeness and the absence of a complete annual cycle.

Reply: In Sec. 2 of this revised version, we added the following paragraph about the implications of using only a few months of measurements: “It is important to highlight that a dataset spanning a few months is insufficient to represent the full seasonal cycle and interannual variability of rainfall. This limitation has important implications for the use of OpenSat4Weather in the development and evaluation of rainfall retrieval algorithms. In particular, it increases the risk of overfitting during SML calibration, potentially resulting in biased model parameter estimates. Moreover, model validation is constrained by the reduced statistical robustness of key performance indicators”.

3. A dedicated subsection providing practical recommendations for users (e.g., handling missing data, anomalous links, wet-antenna effects, signal saturation, and station selection criteria) would increase the dataset's accessibility and long-term impact.

Reply: For SML processing there are just a few studies available and no “best-practises” have been established as far as we know. Hence, we decided to refer to CML data processing, which has been widely explored and has many similar aspects as SMLs. In reply to the reviewer’s comment, we have added a new section before the conclusions (Sec. 6 in the revised version), named “Practical recommendations for working with SML data”. We moved a few statements from elsewhere in the manuscript into this new section as they are suitable to appear in a section where practical recommendations are given.

Minor comments:

1. Section 3.2 refers to "Section" without a section number.

Reply: we added the missing section number (Sec. 3, first paragraph)

2. Typo: "ressential" instead of "essential".

Reply: Done

3. In general, a typographical and grammatical review is recommended.

Reply: Done. See our comments at the beginning of this document

Reply to Reviewer #2

Review #2

I think the manuscript has been improved during revision. In particular the point concerning licensing has been clarified. I have a couple of minor comments that should imply minor changes in the manuscript.

In the sentence about Panthere data, please include the meaning of the time stamp, which is referred to the end of the scan and the fact that this is a nominal time, since rain estimation involves sweeps at different elevations that generated data before the time stamp.

Reply: The information about the meaning of the time stamp of radar data is at the end of Section 3.3 entitled “Data formats”. We rephrased this statement highlighting the interpretation of the time stamp of radar data as suggested by the reviewer (see last statement of Sec. 3.3).

The second point concerns the collocation of the 0° isothermal in stratiform and convection. I insert my considerations in CAPITAL LETTERS inside the text of the manuscript copied below.

"Convective precipitation is characterized by vertical winds (downdrafts and updrafts), which generate high-intensity localized phenomena, and it does not exhibit a clear separation between frozen and liquid phase. Radar observations show that the 0°C isotherm stands 200-300 m above the bright band (WHAT IS THAT, THE PEAK OR THE TOP?) (Thurai et al., 2005), when the latter is visible and, in some cases, even 500 m above it (IF VERTICAL WIND OCCURS, THE BB SIGNATURE DISAPPEARS AND THIS IS OFTEN THE CASE. The rain height during convective events can extend much above the 0°C isotherm level when strong updrafts are detected, even though the vertical distribution of rain is not uniform (ACTUALLY WHAT IS FOUND IS THE PRESENCE MIXED TYPE AND MIXED PHASE HYDROMETEORS, THAT IMPLIES ATTENUATION DIFFICULT TO ESTIMATE)"

Reply: These statements are in Sec. 3.1. They do not add relevant information for the paper development. Moreover, the reviewer comments unveil that they are not even clear. Here we are interested in the rain height, and we already stated a few lines above in Sec. 3.1 that 1) the lower boundary of the bright band corresponds to the 0°C isotherm height, which is important as the melting layer can be detected through radar observations, and 2) convective precipitation is characterized by vertical winds (downdrafts and updrafts), and there is not a clear separation between frozen and liquid phase.

Therefore, we decided to remove the statements mentioned by the reviewer. Instead, we added the following simple statement in the revised manuscript, suggested by the reviewer's comment: "As a result, mixed type and mixed-phase precipitation coexist and the bright band disappears (Houze, 1997), which makes rain attenuation difficult to estimate".

Also, we added a citation to the classical paper by Fabry and Zardecki (Fabry, F., and I. Zawadzki, 1995: Long-Term Radar Observations of the Melting Layer of Precipitation and Their Interpretation. J. Atmos. Sci., 52, 838–851), when we mentioned the relationship between 0° isotherm height and top of the melting layer, to justify our statement.