

Interactive comment on “Measurement Characteristics of an airborne Microwave Temperature Profiler (MTP)” by Mareike Kenntner et al.

Anonymous Referee #2

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This paper describes analysis of the various components of an airborne passive microwave radiometer designed to estimate temperature profiles above and below an aircraft. Given that such an analysis has not previously been published, this work can serve as a valuable source of information for researchers attempting to use data acquired from the MTP. The paper’s focus on instrument performance fits well within the scope of AMT subject matter.

While the analysis is thorough in that it considers the performance and uncertainty associated with individual components of the sensor as well as calibration methods used, some improvements to the paper are warranted. I recommend that the paper be

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published with the following revisions.

General Comments

1. The paper sometimes reads more like a technical report than a journal article. I would suggest the authors begin with a broader view of such instruments, including their basic operating principles and their scientific applications. Reference to similar instruments should be included here as well. Then state the motivation for this work and how it supports research with MTP data.
2. The authors note that the MTP was developed by a team at JPL. While the developers have not published comprehensive instrument characteristics, one wonders whether they may have performed some of the work described in this paper. Have the authors reached out to the developers to understand whether this information exists within the JPL group, and if their results are consistent with the DLR team’s findings?
3. While interesting, the work presented in Section 5 on sensitivity of LO frequencies and elevation angles seems to be outside the central theme of the paper. After presenting results on performance of various components, calibration methods, and associated uncertainties, it would seem more natural to discuss how performance and uncertainty impact the final measurement and applications. There is some reference to use of the data for gravity waves and the requisite accuracy for that application, but a more general discussion would make the paper more broadly relevant to readers.
4. Substantial improvement to the readability of the paper is needed. As noted in Comment 1 above, much of the information is presented as if this were a technical report. Following the Introduction, each section needs to begin with an overview of its contents, motivation for including that content, and how the content fits into the overall purpose of the paper. The material within a section is often not well-organized, paragraphs seem short and choppy, and transitions between topics are lacking.

Specific Comments and Questions

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p4 eq. 2.1 - Is T the physical temperature? BT is defined here as brightness temperature, but elsewhere in the paper, TB is used (e.g., eq 3.3 on p9).

p4 line 28 - You state that the target is heated to a constant temperature of approximately 40C. In Table 1 the value is given as 41C. Why not just use 41C in both places?

p5 lines 1 - The explanation of brightness temperature is awkward and confusing. How about "...which is the temperature of an ideal blackbody emitting the equivalent radiance..."

p6 line 12 - Reference is made to the antenna diagram. It would be good to direct readers to the corresponding figure (Fig 2, I believe).

p6 line 13 - "half-sphere" should read "hemisphere"

p8 line 5-10 - It would be informative to share the range of ambient temperatures experienced outside the pod in flight.

p9 line 6 - "a" should read "at"

p10 line 16 - Section 4 includes uncertainty from pointing errors in addition to calibration methods. The title should reflect this, or the point error material should be placed elsewhere.

p14 line 23 - The sentence that begins with "Note that this definition of usable legs..." is confusing. I'm not sure what you mean.

p17 line 9 - This sentence lacks a verb.

p22 line 17 - If the authors choose to keep Section 5 as a discussion of new measurement strategy, it would be interesting to demonstrate the impact of LO shifts and/or elevation angle changes on simulated data.

p22 line 31 - "full-with-half-maximum" should read "full-width-half-maximum"

p34 Figure 5 - A legend is needed here

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p40 Figure 11 and 12 - These figures are too small to differentiate the individual lines/methods.

p44 Figure 15 (left panel) - It's impossible to distinguish the 58.363 GHz line from the 56.363 GHz line

p45 Figure 16 - The legend indicates lines for 6 altitudes are shown, but I can only see 4 on the left plot.

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