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Geoscientific Instrumentation Methods and Data Systems Discussions
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Interactive comment on "Radio frequency interference mitigating hyperspectral L-band radiometer" *by* Peter Toose et al.

Anonymous Referee #1

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General comments

The authors points out that RFI is a problem for spaceborne radiometers operating in the protected band and that the equipment that they have used for this paper can be useful in field campaigns aimed at calibrating/validating such satellite missions. However, the instrument used here (1400-1550 MHz) has a significantly wider passband compared to the spaceborne instruments (1400-1427 MHz). The reason for this difference is not clearly stated. Also, it is not clear if/how this difference affects RFI detection within the protected band.

The authors describe how RFI are detected. Though it is important to specify also how the mitigation is implemented. My guess is that once a sample is considered as RFI-affected it is removed, so that the output is the average of all the RFI-free channels.

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Discussion paper

But this is not stated in the text.

The calibration is well described.

Some questions remain on the detection algorithm.

It is generally a good paper. The authors put quite a lot of effort in the validation of their results on both simulated and actual measurements. A minor revision is needed before it is suitable for publication.

Specific comments

Introduction

The name of the mission is “Aquarius/SAC-D”, and it was launched jointly by NASA and CONAE. Aquarius is the name of the main instrument.

Soil moisture is the objective for SMOS and SMAP, not for Aquarius. Reword for clarity.

ITU regulations allow spurious emissions in the protected band, as long as they are sufficiently weak.

What do the authors mean by “avoid RFI”?

2.1

It would be clearer if a block diagram were included as well.

3.3

P8 L19-20. This sentence is misleading. The natural thermal emission has a Gaussian distribution. However, when looking at it across frequencies one should expect a uniform distribution.

Also, the dataset in Fig.3 is not a Gaussian distribution. It is the sum of two things: thermal noise (Gaussian) and RFI (not Gaussian). Please review the instances where

a Gaussian distribution is mentioned.

The authors state that the inflection point is representative of the mean if there are no RFI. Is it also representative of the mean for the dataset in Fig.3? If not, please review wording.

All the Tbs above the inflection point are considered as RFI? This seems a very conservative approach. If this was the authors' intention, it is probably worth mentioning it explicitly in the text. Also, if only the measurements below the mean are used, the output will underestimate the natural thermal radiation. Can the authors comment on this?

More commonly, RFI are identified as outliers above a threshold set to "mean +- N*standard deviations", possibly computing the mean iteratively. Did the authors also try to implement this approach and compare the results with the proposed approach?

P8 L31-32. It is not a normal distribution if there are RFI.

How do the authors cope with the cases of "extreme RFI contamination"?

P8 L32-P9 L1. This is not clear to me. If only the protected band is considered and there are no RFI, then this method does not detect RFI? Maybe the authors meant that if only the protected band is considered and there are RFI, then this method does not detect them? In case the latter is correct: I would expect the band 1427-1550 MHz to be even more contaminated than the protected band, since it is allocated to active applications. How does RFI contamination outside the protected band affect the performances on the proposed approach?

After RFI is identified, how is it mitigated? Are the corresponding Tbs removed? Replaced by the mean?

4.1

P11 L11-12. Yes, generally sky calibrations are done pointing out of the galactic plane.

The Moon should also be taken into account.

4.2

Figure 7. Can the authors add a line at Tb-mean = 252 K.

It would be interesting to have also a plot of DeltaTb (Tb-mean – 250 K) against the percent of contaminated bandwidth. It would give a more general idea of the performance of this method.

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Technical corrections

P1 L27. Capitalize moisture

P3 L11. Capitalize CPU

P3 L18-19. Replace “Ten microsecond 1024 (512 horizontal and 512 vertical channel)” with “Ten microsecond 1024 channels (512 horizontal and 512 vertical)”

P4 L28. Replace “out” with “of”.

P5 L29. Replace “observed” with “made”.

P6 L2. Please remember to update the status of this paper if possible

P6 L2-4. Sentence is not clear, please reword.

P6 L11. Correct “durging”

P7 L22. Remove “1)”

P8 L6. Remove “2)”

P8 L6-7. Reword. Suggestion: the optimization results for the coefficients are used as first guess to run . . .

P8 L11. “science-ready”.

P8 L17. Anterrieu 2011 is a software approach, not hardware.

P8 L21-22. Please reword

P9 L14-19. Summarize this paragraph and refer the reader to section 4.2 where all the details should be included (e.g. why below 2 K is OK)

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