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Atmospheric Measurement Techniques Discussions

Interactive comment on "Assessing the potential of passive microwave radiometers for continuous temperature profile retrieval using a three year data set from Payerne" *by* U. Löhnert and O. Maier

Anonymous Referee #2

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SUMMERY and GENERAL COMMENTS

The authors describe a long term analysis of microwave profiler observations provided by the HATPRO system. The radiometer operated at the Payerne observatory located in the Pre-Alp Mountains in Switzerland. The paper is aimed at an assessment of temperature profiling in order to evaluate the capabilities of ground-based microwave radiometers for a continuous monitoring and adequate applications at national weather services. Therefore temperature profiles retrieved by a multi-linear regression algorithm are compared with radiosonde measurements available twice a day at this site.

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Discussion Paper

Additionally a procedure is proposed to redraw the bias of temperature retrievals by a correction of radiometer brightness temperature observations. Various comparisons are shown to describe the accuracy range that can be expected.

Generally I think that the authors plausibly demonstrate the potential of microwave radiometers for a continuous temperature profiling. Retrieval algorithms assume bias-free observations. On the basis of a three year data set is shown that this assumption is currently not completely achievable for all channels of a microwave radiometer. The investigations about the impact of specific error sources on the radiance measurements result in really interesting and valuable findings.

In my point of view modifications are needed in your manuscript to substantiate the general validity of the conclusions. What I mean is as follows: The authors advertise in the title to assess "the potential of passive microwave radiometers for continuous temperature profile retrieval". Therefore observations of the microwave profiler HATPRO are applied and the system is described in Section 3.1. So far so good; but in the following the notation HATPRO is used as additional term for everything (HATPRO measurement, HATPRO brightness temperature, HATPRO temperature retrieval, HATPRO precipitation sensor, HATPRO data set, HATPRO quality control, HATPRO retrieval coefficients, HATPRO/radiosonde cases, etc.). The authors should either distinguish between HATPRO relevant statements (i.e. offset, bandpass and beamwidth studies) and conclusions which are generally valid for microwave profiling, or modify the title.

After corrections and clarifications the manuscript should be accepted for publication.

SPECIFIC COMMENTS

Page 7439 line 18pp

The authors apologise to the reader for analysing a period in the past and be afraid possibly not to describe the "state-of-the-art MWR anymore". Readers become dis-

AMTD

4, C2718–C2722, 2012

couraged by this statement and I propose to delete the phrase for this reason. As a kind of compensation authors offer (line 20) insider information “when relevant to the analysis”. Partly they aren’t relevant because they have no influence on the conclusions of the paper.

Example: page 7449 line 2, “... the random blower and heater are now operated with maximum power in the latest RPG HATPRO software version. “.

Example: page 7441 line 20, “Just recently the manufacturer has acquired the possibility of measuring the channels bandwidths precisely ...”.

What is the meaning of ‘now’ and ‘just recently’ for a person reading your paper in five or ten years time. Several more of these insights are given in the manuscript and the authors should think about a special paragraph with upgradings taken after the time period discussed in their paper.

Page 7447 line 21-22

The authors should provide some more details about the operating schedule.

- What is the reason to perform elevation scans every 15 min?

- What is done beetween?

- Are temperature profiles available calculated from zenith observations only?

- If yes, how do they agree with elevation scan retrievals?

Further down (page 7453 line 17) is stated “The high accuracies below 1 km are due to the information contained in the elevation scans”. That is not proven in the manuscript. Nevertheless, this is an interesting and important point for an evaluation of the potential of continuous monitoring. It would be valuable if authors could illustrate the effect with observed data.

Page 7451 line 14

AMTD

4, C2718–C2722, 2012

Fig.3 shows systematic differences for selected frequencies and 90° elevation. An additional table or text extensions containing numerical values of TB differences for zenith and other elevation angles would make it easier for the reader to be aware of this important fact.

Page 7453 line 24pp

The summary "... we can say HATPRO can deliver reliable and accurate temperature profiles in 88% of all-sky cases ... and an uncertainty from ... to ..." sounds too strictly rather as a natural law than a result of your Payerne study. Probably other availability rates and uncertainty ranges could be detected at other sites (e.g. tropics or Arctic).

Page 7455, Section 6.4 Significant weather

I'm not sure if the findings of this section can be really assigned to a category 'Significant weather'. Authors admit that only 60% of the cases, classified as frontal, passed the quality-control. The question remains, if precisely those 40% of cases which had been rejected aren't more typical for those weather situations defined as 'significant' by the authors. Further, I don't understand (line 16pp), why are the regression coefficients not derived for the subset 'significant weather'? In the manuscript is declared that MWR radiances were calculated for approximately 10000 radiosondes (page 7438). Moreover, why are nethertheless the rms errors smaller than those for all cases although the regression coefficients are not associated with this subset? Please, clarify!

Fig.5-8

In the text exclusively the expression 'STDEV' is used and in the legend the notation 'rms'. The captions refer only to 'Temperature differences'. If you mean always the same, please, say so; otherwise clarify!

Fig.7

Legend and labels are too small. I recognize quite similar plots in the left and right panel. Differences are apparent only for the levels from 0 to 300m. I think the authors

AMTD

4, C2718–C2722, 2012

should accentuate these levels more clearly by fitting the y-axis.

MINOR COMMENTS

Page 7436, in the abstract HATPRO should be introduced as 'microwave' profiler

Page 7449 line 4, "third" should be "fourth"

Page 7452 line 23, "m.s.l." should be "a.g.l."

Page 7468 Fig.7, "A total number of 2088 HATPRO/radiosondes were available" is pasted from Fig.6 into the caption of Fig.7. This part of sentence is dispensible because no results are shown regarding this data set

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Interactive comment on Atmos. Meas. Tech. Discuss., 4, 7435, 2011.