

Interactive comment on “A model-based approach to adjust microwave observations for operational applications: results of a campaign at Munich Airport in winter 2011/2012” by J. Güldner

Anonymous Referee #2

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Review: A model-based approach to adjust microwave observations for operational applications: results of a campaign at Munich Airport in winter 2011/2012 by Jürgen Güldner

The author presents a generalization of his REGobs retrieval method used to retrieve water vapour and temperature profiles from microwave radiometer profiler observations at the DWD Observatory in Lindenberg. The method allows application to any microwave radiometer profiler (MWRP) location if, simultaneously, model analysis output is available. The model analysis is basically used to correct for systematic error in temperature and humidity profiles, which is often present in MWRP observations.

C1143

This is done by directly using MWRP observations and model analyses to train the regression algorithm REGmod. Radiosonde measurements are used to evaluate the performance of REGmod. Before I can recommend this manuscript for publication in AMT, I would suggest the author to consider the following major points:

1. The author should extend the analysis and differentiate between clear, cloudy and possibly precipitating cases. In order to be network-suitable, a MWRP retrieval must deliver reliable results in nearly “all-weather” cases. If this can be shown, this would enhance the relevance of the manuscript.
2. Also, I would find it important to analyse the bias behaviour as a function of time of day. The radiosondes from Oberschleißheim could be used to evaluate 0 vs 12 UTC retrieval performance, also REGmod could be cross-checked against the hourly COSMO model output to see if the MWRP is principally able to capture the diurnal cycle adequately.
3. From my point of view, Fig. 6 should provide the most important and essential information of the manuscript: that REGmod and REGobs do or do not compare in accuracy. However, I cannot draw this information from the figure in a conclusive way, because the training data sets the Lindenberg and Munich retrievals were derived from differ statistically - probably both due to station characteristics (climatology) as well as to different sub-sample size (using different months?). This can be explicitly seen from the STD curves (black) shown in Fig. 6, bottom. Now, since the variability of temperature and humidity in the training data set determines the derived retrieval uncertainties to a certain extent, the results from REGmod (Munich) and REGobs (Lindenberg) cannot be compared 1:1 as carried out by the author in Fig. 6 and the discussion in Section 4. So my question here is very simple: why does the author not apply the REGmod retrieval to Lindenberg data? He could then use training data from the same location and time period for creating both REGmod and REGobs – this would then allow a much more conclusive assessment of the REGmod method. Of course, the application to Munich data could additionally underline the applicability of the method.

C1144

Some further minor points:

1. A native speaker should check the English used in this manuscript, i.e. Page 2944, line 23: “redraw” – does the author mean “withdraw” here? There are several of such improper formulations, which could lead to misunderstandings.
2. Sections 3 and 4: The authors should note which frequencies and elevation angles are used to derive the temperature and humidity profiles. Also it is important to note on which temporal resolution the MWRP measurements are available. And in addition, the author needs to state how large the training and testing data sets used for the different REGmod versions are.
3. Page 2936, line 17: The bias can also be caused the retrieval uncertainties, i.e. a non-representative training data set.
4. Page 2941, line 13: I would not speak of “inaccuracies” in general, but more of systematic uncertainties.
5. Equation (1): x_0 and y_0 are not described in the text.
6. Page 2945, lines 2-3: “Note, ...” What does the author mean to say with this sentence?
7. Page 2945, line 9: What “nonlinear relationship” is the author talking about? Could he show an example?
8. Page 2945, line 24: With “a.s.l.” does the author refer to “above sea level”? Isn’t “above ground level” the correct term here?
9. Page 2946, line 20: What does the author mean with “good correlation” – please specify quantitatively.
10. Page 2946, line 21: MWRP are capable of deriving highly accurate temperature ($< 0.5\text{K}$ uncertainty) profiles in the lowest 500 m if elevation scans are used (see e.g. Crewell and Löhnert 2007, TGARS). The author should comment on this.

C1145

11. Page 2946, line 27: What does the author mean with “permanent interferences”. Generally “interference” in the microwave region tend to be “spiked” and thus temporally highly variable in they are in connection to active, transmitting sources
12. Fig. 2 (and Fig. 3): Please use frequency in GHz on x-axis instead of channel number (Fig. 2). It is also not clear how many measurements are used to create the plot. If the author would like to underline the problem of general systematic TB differences between MWRs and/or radiosondes, he should either point to suited references or show statistically significant comparisons showing systematic and random differences. From my point of view, no conclusions can be drawn from regarding just one day.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 2935, 2013.

C1146