

## ***Interactive comment on “Study of cloud effect on the tropospheric temperature retrievals” by F. Navas-Guzmán et al.***

### **Anonymous Referee #1**

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#### GENERAL COMMENTS

The paper AMT-2013-327 by Navas-Guzman et al. describes the results of an experimental set up for investigating the effects of clouds on the retrievals of temperature profiles from a ground-based microwave radiometer. It is an interesting analysis that may help improving the temperature profile retrievals from ground-based microwave radiometers.

However, I think the authors miss to give credits to previous work when they state (introduction, conclusions) that "so far, clouds have not been properly treated in the forward models". In fact there are several algorithms which include clouds in the forward model, both of statistical (Solheim et al., 1998; Ware et al., 2003) and physical

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(Löhnert et al., 2004; Hewison, 2007; Cimini et al., 2009) types. The authors should explain careful what they mean with the above sentence.

#### SPECIFIC COMMENTS

page 1309, line 4-6: the following sentence is not exactly true and should be understated: "The elevation angle of the ceilometer has been set to 40 deg to guarantee the observation of clouds in the same direction as TEMPERA is measuring."

page 1309, line 9-10: the radiometer is pointing south east, while the radiosonde are launched west of Bern. What is the expected contribution for this mislocation?

page 1310, line 21: I think that  $K=dF/dx$  is usually called Jacobian, while weighting function is  $WF=dF/dxdh$

page 1311, line 1-3: Why not using the TROWARA IWV to scale a standard WV profile?

page 1312, line 12-13: The authors say the method is not sensitive to the chosen constant LWC within the cloud. This may be counter intuitive, since LWC and ILW together determine the cloud thickness. Could the author show convincing examples (e.g. adding a line using different LWC to Figures 5-6-7)?

page 1313, line 8-10: Why not also using all channels? The effect should be even more evident; also it would have broader interest, as most of commercial MWR use the whole 51-58 GHz range, regardless of clouds. In addition, this choice may generate ambiguity. For example, in Figure 5-7 one cannot tell if the differences are due to the cloud in the forward model or simply to the different channel sets.

page 1313, Section 4.1: in addition to physical thickness, the authors should report the cloud optical thickness (in terms of ILW) for each and all the study cases.

page 1314, line 23-end: The discussion here is weak. The authors should try to explain in detail why the far range affects one retrieval more than the other. In addition, the LWC profile was assumed to have negligible effect (see my earlier comment), so it cannot

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be blamed now to be the reason for the discrepancies.

page 1315, line 13-15: The bigger discrepancies are due primarily to the fact that the used channels have low sensitivity to high elevation levels and thus the retrieval rely on the climatological mean.

page 1317, Conclusions: The reason of unclear results may be that the retrieval with no clouds does not use channels lower than 53 GHz (see one of my earlier comments). I suggest to perform the retrievals with no clouds using all channels and compare the results with the other two. This may help in clarifying the conclusions. Also, the discussion on the cloud base altitude effect is rather poor.

page 1318, line 2-5: This conclusion is maybe not too surprising, as clouds with ILW<0.1 mm have likely little impact on TB. To show this and help the discussion, it would be very useful to show 3 types of clouds in Figures 3 and 4, as representative of the 3 case studies presented here.

#### TECHNICAL CORRECTIONS

page 1309, eq.1: the authors should mention the frequency dependence of TB, tau and alpha

page 1311, line 5-6: Not clear; please rephrase.

page 1315, line 26: radisonde -> radiosonde

page 1316, line 1: correspond -> corresponds

#### FIGURES

Figure 3: The authors should state the ILW and the boundaries of the cloud used for obtaining this figure. Is this the one in Figure 4? To help the discussion, I'd suggest to show 3 kind of clouds in Figures 3 and 4, resembling the 3 case studies presented later.

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