Manuscript amt-2013-49 responses to Reviewer 1

page 6, line 3: It has been demonstrated in the past that the consistency between clear sky observations from two colocated MWR does improve when instantaneous tip curve is applied to both instruments. The authors should discuss the implications of their choice to not updating the calibration every time a new tip curve is collected.

In the case of the 2-channel MWR, the instantaneous values of noise injection temperature derived from valid tip curves are used to update the regressions of noise injection temperature against the internal blackbody temperature, which accounts for most of the day-to-day calibration variations. The instantaneous value of blackbody temperature is then used to evaluate the regression results to determine the current value of noise injection temperature for each channel. It has been shown (Liljegren 2000b) that this procedure reduces the RMS variation in the resulting brightness temperatures compared with instantaneous tip curves. Additionally, this procedure allows stable calibrations to be maintained during extended cloudy sky periods by characterizing and accounting for temperature-related calibration variations.

We added the following explanation: "This procedure avoids jumps in the brightness temperatures when the calibration is updated. The benefits of not updating the instantaneous tip curves are particularly evident in the high-frequency radiometers (section 4) where the instantaneous tip curve results can cause jumps of 1 degree in the calibrated data."

page 6, line 11: The authors should explain what happens in case of long periods with no clear sky, as there are situations in which such conditions may persist for days. The authors say that "the receiver gain is monitored through frequent viewing of the internal black body target", but it is not clear if the monitoring is followed by any kind of correction. Is this method sufficient to meet 0.3 K estimated accuracy?

We added the following: "Noise diodes used in the radiometers are usually very stable and will work for months without drift. Therefore during times of reduced tip curves it is sufficient to calibrate the drift in the gain. If drifts in the noise diode occur data are recalibrated or flagged in Data Quality Reports (DQRs)."
Usually the 2-channel MWR are able to keep the calibration even in places with high cloudiness. The same is not true for the high-frequency radiometers that have a lower success rate. For example in some locations the 150-GHz radiometer can stay months without collecting a successful tip curve. If this is the case the data are post processed and eventually flagged if the calibration accuracy appears degraded.

page 7, line 16: How well is known the absorber emissivity? What is the uncertainty of the black-body assumption?

As mentioned in the paper the instrument uses a Firam-160 absorber for both the hot and warm calibration loads. The absorber is a silicone-based wedge-structured material oriented so that the electric field is perpendicular to the fin direction. In this configuration the manufacturer specifies a reflectivity below -30 dB (emissivity close to 1).

page 7, line 21: Even if the accuracy of the temperature sensors is approximately 0.1K (it was 0.2 K in the first draft, which one is correct?), the uncertainty in measuring the absorbers' physical temperatures is larger, due to thermal drifts within the absorber material. How many sensors are in place? The authors should give more information and explain if this effect is taken into account in their error propagation analysis.

The initial 0.2 K was corrected after reviewing the manufacturer specifications that quote '0.1 K' (Pazmany, 2007). We modified the sentence as follows:

"The absorber brightness temperatures are taken to be equal to their physical temperature. The hot absorber is enclosed in a convection-heated box. Two temperature sensors whose accuracy is 0.1 K (Pazmany 2007) are located in the absorber. One sensor is near the edge and the second near the middle and their average is used in the calibration equation as the hot load equivalent brightness temperature. This temperature uncertainty is the largest source of error in the calibration. It is accounted for in the quoted uncertainty however it may be easily underestimated."

The warm absorber has just one sensor because is not heated it so there should not be significant temperature gradient.

page 10, line 1: If the continuity of operations with the two-channel MWRs was a requirement, the authors should explain why the new radiometers MWR3C have different field of view and central frequency (at one channel at least) with respect to MWR.

The design of the new radiometers was conceived as a compromise between the desire to have continuity with the old MWR and the need for improved measurements. Added the following:
"The design of the new radiometers balances the need for continuity of operations with the desire to improve the retrievals. For this reason the new instrument retained the 2 low-frequency channels as close as possible to the old MWR (the frequency differences are due to hardware restrictions on the frequency synthesizer) at the same time introducing a narrower field of view that is closer to the 90 GHz channel and to other instruments such as the infrared interferometer."

page 13, line 16: The authors should refer to previous studies to support the statement that higher frequency channels reduces the PWV and LWP uncertainties.

Some good ones are already in the reference list.

Added references to Cimini et al. 2007, Cimini et al. 2009, Lohnert&Crewell 2003

page 15, line 5: The authors should motivate their choice to include only positive LWP values, as this may bias the mean value with respect to the mean of the set used for training the statistical retrieval.

The inclusion of negative LWP values may produce unrealistic values of the median LWP that is te reason why we excluded them for this illustrative plot. We modified the sentence:
"The negative values were within the uncertainty of the retrieval and consequently were assumed to represent clear sky conditions. They were therefore excluded from the calculation of the median LWP in this figure to avoid introducing unrealistic results."

page 15, line 13: The authors should state clearly that the radiosonde profiles used to compute PWV in Figure 12 are the original measurement, i.e. not scaled by any MWR measurement (as the ARM lssonde value-added product).

Done

page 15, line 25: The sentence "Uncertainties in the MWR-STAT retrievals are derived by applying the derived coefficients to the training ensemble" seems to suggest that the coefficients are derived from and applied to the same ensemble; this is probably not the case, so I'd suggest to change "training" with "test" or rephrase the whole sentence.

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