**Atmospheric
Measurement
Techniques
Discussions**

Interactive comment on "ARIS-Campaign: intercomparison of three ground based 22 GHz radiometers for middle atmospheric water vapor at the Zugspitze in winter 2009" *by* C. Straub et al.

Anonymous Referee #2

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The authors report on an intercomparison of three 22 GHz radiometers for middle atmospheric water vapor. The radiometers were located at the same high mountain site and measured simultaneously, which allowed an intercomparison not only of water vapor profiles but also of the measured spectra and the noise levels. These kind of intercomparisons are important to improve ground based observations and to characterize and validate uncertainties. This study is a relevant contribution in this respect and merits publication.
The paper is well written and follows a logic structure. I recommend this work to be published after minor revisions.

Comments:

Abstract

Generally, it would be helpful to report also relative differences (%) and not only absolute differences (ppmv). This makes cross checks with other studies easier.

Introduction

The introduction is missing an overview of the actual state of research on middle atmospheric water vapor with a focus on how ground based mw radiometers contribute.

Section 2

Change title to "Description of the instruments"
P3364/l27 replace "to avoid" with "to minimize"

Section 3

P3367/l14 Use an other letter for the equivalent transmission, as t is already used for time in Equation 5.

Section 3.1

P3369/l20 The use of a noise diode should also be mentioned in "Calibration Methods".

P3370/l5 Give the reader some more information, how this result is achieved. Derivatives are built with respect to V_{hot}, V_{cold}, V_{sky} and V_{ref} and the uncertainty in these variables are given by Equation 5 with $a = 1$. It should also be stated, that proportionality between signals (V_{hot}, ...) and T_{sys} has been used.

Equation 10 and 11 are supposed to be estimates of the noise, corrected for tropospheric attenuation and for the airmass ($\sigma\star$). However, if error propagation has been applied to equation 1 and 2, this estimate refers to the uncorrected noise. This has to be clarified.

P3370/l13 ".. As described above" refer to equation 9 here.

P3370/l20 Is the "simulated Gaussian noise of a total power spectrum" given by equation 5 with a=1? If so, please refer to the equation. If not, explain how these values have been calculated. In caption of figure 2, a monte carlo simulation is mentioned. Explain where, how and why a monte carlos simulation has been performed.

Section 4.3

P3376/l27 Explain, how calibration load temperature and pointing (which influences the cold load temperature estimate) are taken into account for MIAWARA-C.

P3377/l20 This is not clear. Do the authors want to conserve the column density?

Section 5

P3378/l3 This is not clear. Are the gaps due to the weather conditions? In what sense is the measurement noise "inconsistent"

Section 6.3

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Here, the authors should give new estimates of the noise level for comparison with the values in table 2 and make a comment how these improvements do or will affect the retrieval, i.e. altitude range.

Table 2

Explain t_{tot}.

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