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Interactive comment on "First middle-atmospheric zonal wind profile measurements with a new ground-based microwave Doppler-spectro-radiometer" *by* R. Rüfenacht et al.

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Reply to comments from referee #2

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- blue: referee's comments
- green: author's replies

General Comment:

This is a very interesting paper and it is important for the ground-based microwave remote sensing community.

Specific Comments:

P 5116 L 8: Probably you do not need the highest absolute calibration since you compare different spectra taken within a short time period. Please clarify this.

The brightness temperature T_b in Kelvin is calculated from the raw spectrum U, containing the counts of the spectrometer for each channel, through the equation $T_b = a \cdot U - T_N$. The two parameters a and T_N are determined in the calibration

process by measuring the signal from reference targets. In our case these targets are an ambient temperature load, the sky in zenith and the sky at 22° elevation. In the case where the sky at 22° elevation is used as reference we take the mean over two raw spectra (in counts) from opposite viewing directions for the reasons given in the manuscript (page 5116, line 16-19). This implies that the calibration parameters a and T_N are identical for the two spectra that we compare in the wind retrieval.
For wind measurements it is important that the calibration does not alter the frequency information. However, the absolute value of T_b is not important. Therefore a and T_N do not have to be known with the highest accuracy as long as possible offsets from their real value are similar for every spectrometer channel. This is what we were trying to express by our statement that we do not need the highest absolute accuracy in the calibration. In our narrow band application the two point tipping curve calibration scheme described in the manuscript is absolutely sufficient for our purposes.
The relatively short time period within which we measure spectra from opposite viewing directions has primarily been chosen to exclude errors from slow frequency drifts of our oscillators and not for the accuracy of the calibration.

P 512-5123: The sections about the mirror and the centroid methods would be easier to follow if they were clarified with a figure showing the principles. Why gives the mirror method a higher precision compared to the centroid method?

Unfortunately we do not see a way to adequately visualise these analytical expressions with a figure. The statement that the mirror method provides a higher precision is the result of careful Monte Carlo simulations.