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Atmospheric Measurement Techniques Discussions

AMTD

5, C2200–C2202, 2012

Interactive Comment

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

Anonymous Referee #3

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The method of measuring middle atmospheric winds observing the ozone spectrum in the microwave regime has been already proposed by Dewey Muhleman in the late eighties. This publication shows the first implementation of such a measurement system providing zonal winds on a routinely basis. The paper addresses relevant scientific questions within the scope of AMT.

Specific comments:

5113 Line 23: "This leads. . .". No! The line shape depends mainly on the vertical profile of ozone and it does not matter whether the line intensity is high or not (since the line is not opaque in the cases considered here). Different tropospheric transmissions do not significantly change the line shape (create or not steep line wings, etc.)

5113 Line 24: ". . . in terms of signal to noise ratio." I see no relationship between steep line wings and SNR. What counts is only the ratio of brightness of the line and rms noise.

5114 Line 24: "The radiometer is operated in the lower sideband. . .". How is it possible to operate a double sideband radiometer just in the lower sideband? You probably mean that the LO tuning is such that the ozone line appears in the lower sideband. Please clarify!

5115 Line 25: Why not using one frequency reference (e.g. the GPS signal reference) for all oscillators? A good design should consider this option.

5117 Line 7: Since the elevation angle is rather small, small errors in the knowledge of the angle may produce large errors in airmass assumptions and wind speeds. Therefore a number for the accuracy of this angle in your system should be given.

5120 Line 1 -2: Can you explain why fitting the Doppler shifts of the corresponding Voigt profiles are more affected by radiometric noise? Are you introducing apriori information by using the mirror and centroid method? Introducing a Doppler shift as fit parameter (e.g. in the optimal estimation method) seems to be the straightforward approach. I think you get better results with the methods you describe just, because you introduce the WIRA levels, i.e. you assume that the layers are orthogonal (by handling them separately). However in reality this is not the case, at least in realistic spectra containing noise. Therefore it is not really amazing that the methods you use produce less noise in the winds you derive. You would probably get the same if you do 5 separate OEM retrievals for the 5 altitude layers always putting a high constraint (apriori) the other 4 levels. A short discussion why you think mirror and centroid methods are better than OEM would be helpful. As it stands now it looks a bit like trial and error.

Please also clarify what is the influence of baseline ripples in determining the centre frequency with these methods. Doesn't a baseline ripple create a frequency error? How does this error propagate?

What kind of temperature profile are you assuming by defining the WIRA levels? Does the temperature profile you use have any influence on the retrieved wind speeds? How large are the error bars of the temperature profile?

5121 Line 6: why not interpolating between the spectrometer channels?

5121 Line 16: what means "double sideband calibrated"? (Do you mean "calibrated double sideband spectrum"?)

5124 Lines 3-4: which code was applied to what?

5124 Line21: "sharpness": do you mean gradient?

5125 Lines 13-15: of course according to the definition of the widths of the WIRA levels. But the input winds are layers at least as broad as the WIRA levels. Therefore the conclusion is not obvious and quite likely another reason (e.g. SNR too low) applies here. Please clarify!

5132 Table line 2: "LO of PLL cycle". The "cycle" seems to be redundant ("Loop" in the PLL).

5146 Fig. 11: Please create another plot showing the differences between WIRA and ECMWF.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 5107, 2012.