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Atmospheric Measurement Techniques Discussions

Interactive comment on "Middle-atmospheric zonal and meridional wind profiles from polar, tropical and mid latitudes with the ground-based microwave Doppler wind radiometer WIRA" *by* R. Rüfenacht et al.

Anonymous Referee #1

Received and published: 3 September 2014

The paper is well written and pleasant to read. It describes a novel and unique method to derive wind in the upper strato- lower mesosphere. The paper builds on and significantly improves a previous work by Ruefenacht et al., 2012.

I have a few minor comments and suggestions for technical corrections:

It would be helpful if the temporal and altitude resolution and the accuracy are given in the summary and the abstract. Otherwise readers will extract their own numbers and these will likely not be as good as they are.

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In the introduction a reference to radar data seems to have gotten lost, leading to a statement that is wrong: "... However, in the middle atmosphere the only continuous source of wind data so far were models. A gap region with a lack of measured ..." MF Radars are performing continuous wind measurements in the middle atmosphere sometimes down to 50 km, usually down to 70 km e.g. Singer et al., (2003), Hoffmann, JASTP, 2007 or http://www.atrad.com.au/products/scientific-radars/mf-radar/. I suggest to correct the statement.

The references to rocket aided techniques seem to be biased to recent results. Older references could be:

Finger et al., Compatibility of Meteorological Rocketsonde Data as Indicated by International Comparison Tests., Journal of the Atmopheric Sciences, 1975,vol. 32, Issue 9, pp.1705-1714

or regarding TMA:

Edwards, H. D., M. M. Cooksey, C. G. Justus, R. N. Fuller, and D. L. Albritton, Upper-atmosphere wind measurements determined from twelve rocket experiments, J. Geophys. Res., 68, 3021–3032, 1963.

Regarding Microwave wind retrievals on could add:

Baron et al., Observation of horizontal winds in the middle-atmosphere between 30âŮę S and 55âŮę N during the northern winter 2009–2010. ACP, 2013

Figure 11 is correctly discussed in the text, but the figure itself is misleading. Above and below the trustable altitude range the standard deviation of the resulting profiles in the Monte Carlo simulation does not correspond to the "Wind observation error" that is given as axis label. I suggest just not showing the data outside the trustable altitude region. I would also expect that the trustable altitude range is different for each of the curves shown.

Page 7721, lines 7-9: sentence should be checked "in order" is used twice.

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Page 7726, line 2-3: “winds are calculated from the difference between the retrieved wind profiles for east and west ...” I suggest re-writing this sentence to clarify the procedure. Reading the sentence as it is one could also conclude that the difference between the wind profiles east and west should be zero.

Page 7726, lines 7-11: Please consider adding a statement why the wind retrievals are not affected by inaccuracies of the actual Ozon-profiles. Due to the statement on Page 7724, line 10-12: “... Therefore we can state that the effect of wind variations on the measured brightness temperature spectra is approximatively thirty times smaller than for species profile retrievals.” One might (falsely) conclude that if the species retrieval fails the results of the wind retrieval might even be worse.

Page 7727, lines 10-11: “measurement response” is used before it is defined on in the next section (line 21)

Page 7729, line 12: In the text zenith opacities are discussed, but the figure shows noise levels. I suggest adding a sentence how the quantities are related.

Page 7732, line 18: “The results from La Réunion are not plotted ...”. The reader would be greatfull for a plot of the absolute differences to ECMWF in zonal and meridional direction.

Page 7733, line 18: “mesoshperic” should read “mesospheric”

Page 7734, line 8: The statement “... good agreement in the daily average meridional wind” is not quantified, having a plot of the absolute differences (see comment Page 7732, line 18) would help here.

Figures:

Fig. 1: Extend the caption to describe the components of the instrument that can be seen (e.g. mirrors, moving mirrors, . . .)

Fig. 4: Axis labels to small

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Fig. 5: Axis labels to small

Fig. 6: Axis labels missing. The altitude is given in km, but in text altitudes are discussed in pressure level. I suggest to add the pressure level.

Fig. 7 to 16 would benefit if an approximate altitude scale in km is given, or the axis limits are given in km in the figure caption.

Fig. 8: axis labels to small, the explanation of the sub-figures should be given in the caption not in the figure.

Fig. 11: Description of horizontal dashed lines missing.

Figure 12, 14, 15: the figures are much to small.

Fig. 14: Description of dashed lines should be given in figure caption not text.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 7717, 2014.