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Atmospheric Measurement Techniques Discussions

Interactive comment on "Comparison of Vaisala radiosondes RS41 and RS92 at the ARM Southern Great Plains Site" *by* M. P. Jensen et al.

Anonymous Referee #3

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GENERAL COMMENTS

This is a well written and interesting paper that capitalises on the wide range of ancillary measurements available at the ARM site to contextualise the RS92/RS41 measurement differences. This is a particular strength of this paper compared to other studies that are comparing these two sondes types. The analyses are well done and well presented. This study will be of interest to a wide range of radiosonde users both from National Weather Services and from the research community.

This paper would benefit from discussion about the process for merging an historical RS92 radiosonde measurements series with a future RS41 radiosonde measurement series. For example, if a site is switching from RS92 to RS41, what corrections will need to be made to the RS92 data to homogenise them with the newer RS41 data? I

am quite sure that the results from the study are relevant to addressing that question but have not actually been used to do so. Of particular interest would be the need to apply different bias corrections under different cloud cover conditions. This is both particularly challenging but also a strength of this study since it is able to address how different cloud conditions affect the biases between the two sonde types

SPECIFIC COMMENTS

Page 11324, line 10: What exactly is meant by "manufacturer specified tolerances"? Do you mean the manufacturer specified random uncertainties on the measurements?

Page 11324, line 13: With regards to "a smaller impact from solar heating", is that both for temperature and humidity measurements or just temperature measurements?

Page 11324, lines 16-17: The conclusion that "and so a switch to RS41 radiosondes will have little impact on long-term observational records" does not follow from the previous statements. It is possible that while the measurements agree within their random uncertainties, that a switch from RS92 to RS41 could introduce a small systematic bias into the measurement time series that would compromise the long-term record, particularly in regards to trend analyses. As far as I can see, having read the abstract, you have not evaluated the extent to which such biases may compromise a long-term trend. Therefore, I suspect that such a conclusion is not well-founded.

Page 11325, line 19-20: What do the "SGP" and "SG" on the RS92 and RS41 stand for? Are they acronyms for something? I also see in Table 1 "SGPD" instead of "SGP". This is a little confusing. Are the SGP and SGPD sondes different?

Page 11326, line 2: Jensen 2015 is not a peer reviewed publication and so I would recommend that you do not cite this.

Page 11326, line 10: The "RS41/MW41" nomenclature is confusing here. What does the "MW41" refer to? Likewise for "RS92/MW31" 2 lines later. I am guessing that the MW stands for Marwin but maybe not all readers will be able to guess at this.

Table 4: I think that it is misleading to refer to the "radiosonde pressure sensor manufacturer specifications" for the RS41 sonde given that the sonde does not have a pressure sensor. This needs to be made clearer.

Page 11326, line 24: Replace "The RS41 sensor" with "The RS41 humidity sensor" to avoid confusion.

Page 11327, line 2: Replace "The GPS-derived values of the RS41" with "The GPS-derived pressure values for the RS41".

Page 11327, line 4: Either use mb or hPa for your units of pressure but please don't switch. I would suggest hPa.

Page 11327, line 6: I would have thought that the directional uncertainty would be a function of the velocity i.e. under strong wind conditions the uncertainty on the wind direction should be smaller than under light wind conditions.

Page 11328, line 24: And this is primarily because the ascent rate is slower with the twin flights right? Though when I look in Table 5, the ascent rates seem pretty close to what you would expect from a single sonde flight.

Page 11329, lines 21-22: This is not a very wide range of surface temperature conditions. I am particularly interested in the RS41 performance when surface temperatures are below freezing but of course you cannot report on this. I will find some other intercomparison papers that hopefully report on flights done at very low temperatures.

Page 11329, lines 25-29: Much of what is said in these five lines is repeated almost verbatim in the caption for Figure 6. I don't think that this duplication is necessary and the information should appear either only in the manuscript or in the caption.

Figure 7: I don't understand why the dry bulb temperature is labelled as "parcel path" in the legend. The figure caption also needs to explain what CAPE and CIN are.

Figure 8: When looking at this figure I can't immediately understand why the zonal

wind differences are smaller than the meridional wind differences.

Page 11330, line 15: I think that you have to be careful in your terminology. When you say "accuracy" I interpret this as "the systematic error" whereas what is being reported in Table 4 is the uncertainty. Shouldn't you be referring to "precision" rather than "accuracy"?

Page 11331, line 2: Coming back to the point that I raised earlier: If there was a systematic 0.13°C temperature difference between RS92 and RS41 radiosondes this would certainly compromise the homogeneity of the long-term temperature climate data record for trend analyses.

Page 11333, line 22: Yes but a 1 hPa pressure difference at 25 km is far more concerning than a 1 hPa pressure difference at 2 km altitude.

Figure 17: The bottom left X axis is labelled incorrectly.

Figure 19: Why are there no uncertainty bars on the RS92 and RS41 PWV measurements?

Page 11337, lines 16-17: Again I don't think that this is a robust conclusion based on the results that you have presented. You have not shown that a small e.g. 0.1°C systematic bias between the RS41 and RS92 radiosondes would not compromise a 20 year trend analysis where the first 10 years of measurements were made using an RS92 system and the last 10 years with an RS41 system.

GRAMMAR AND TYPOGRAPHICAL ERRORS

Page 11327, line 17: Replace "On the contrary" with "In contrast".

Page 11328, line 17: Should this be "UW1-30 ozonesonde unwinder"?

Page 11331, line 11: Replace "again noticeable" with "again a noticeable".

Page 11335, line 14: Replace "There is some different behaviors" with "There are some

different behaviors".

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 11323, 2015.