Atmos. Meas. Tech. Discuss., 7, C4338–C4348, 2014
www.atmos-meas-tech-discuss.net/7/C4338/2014/

Atmospheric Measurement Techniques Discussions

Interactive comment on "A one year comparison of 482 MHz radar wind profiler, RS92-SGP Radiosonde and 1.5 $\mu m Doppler Lidar wind measurements" by E. Pschkee tal.

Anonymous Referee #1

Received and published: 31 December 2014

General Comments:

This is a timely and useful paper documenting the agreement of a Doppler wind lidar (relatively new wind measurement technique) with a radar wind profiler (well established measurement technique).

I enjoyed reading it. The dataset is excellent for the intended purpose, with a full year of data from instruments sited very close together. The quality of the analysis is very good. In places, the presentation could be strengthened, as noted/suggested below. I would recommend additional consideration of the following:

0. I suggest modifying the title to emphasize to better describe the content of the paper. As written it appears to be about a comparison among all three sensors, and there is no hint that the purpose is to evaluate the utility of the wind lidar.

1. In both the abstract and conclusion, much stronger statements could be made presenting the quantitative result of the comparisons. The abstract only says the wind lidar is "a reliable system", but could say that it agrees with the RWP

to within XX m/s. Similarly, the conclusion speaks of "general good agreement" and "confirms previous studies", but would be stronger by numerically stating how well the measurements agree.

2. The comparison of the lidar winds with radiosondes does not have much detail. Please provide more information and explanation. What is the typical horizontal separation of the measurements (as a function of height), since the balloon drifts away from the site? Is the RS92 wind data really at only 40 s time resolution? Its raw data should be at 1 s; please provide more information. What time difference and spatial difference are allowed when choosing which lidar wind profiler to compare with each radiosonde profile?

3. Please describe earlier in the paper

(introduction?) that processing choices have been made to most closely match the radar wind profiler parameters, in order facilitate this comparison. But in more routine operations there may be better ways to operate the wind lidar. This was not clear to me until p. 11446, lines 14-16.

4. The error estimates for u and v on page 11450 (line 12) and the text that follows are very good to know. However, they do not account for small scale random motions in the atmosphere (turbulence and thermals, for example). This should be made more clear; unless I misunderstand and the 30 cm/s precision from Halo includes these error terms?

5. Section 3.2 is the heart of the paper (at least based on the intent from the Title and Introduction). The section describes what was found. It would be very helpful to postulate

possible reasons where (even small) systematic differences are found. An example is the positive ME in the DLWR comparison above 1800 m. Why might this be, and why might the ME increase with increasing height?

6. [This comment applies to future use of the wind lidar, rather than this paper]. Figures 4 and 5: The R2 threshold appears to eliminate data in some of the *most* interesting areas – e.g. where there is directional shear (750 m altitude, early in the day), and during the growth of the CBL when there are large vertical eddies. It would be a shame if so much data were filtered out. Better if measurements were made with less averaging to find data segments that are more stationary.

7. Figures 10 and 11: The point-to-point variation with height of these profiles looks very large to me for data that is an average of a full year. I would

expect this to be quite smooth. Is there an explanation for this? For example, are there really very few points in the average? Rather than discussing the precision of the wind speeds ("not shown"), it would be valuable to show the standard deviation of the data going into each altitude.

Comments related to specific lines:

p, 11440: line 21. "of course" should have commas before and after

p. 11440: line 25. Is there a reference for the IEEE standard?

p. 11442: line 4. authors', rather than author's

p. 11443: line 6. "such as" rather than "like"

p. 11444: line 2. I don't think clouds are a significant source of backscatter at 482 MHz.

p. 11446: line 2. Is there a reference for the manufacturer claim of the Streamline precision? This number is used later in your error analysis. It is important to know that it is correct.

p. 11447: line 5. Directions

p. 11448: I think this page is saying that SVD is used, rather than standard least squares. It would be good to say this clearly.

p. 11450: line 6. This is where we need to "trust" the manufacturer's claim of precision. Please provide documentation of this value if it is available.

p. 11451: line 4. routinely should be routine.

p. 11451: line 13. scannnig should be scanning

p. 11451: There is an earlier paper that may be worth referencing, which describes a test for a

horizontally homogeneous wind field. (Goodrich,R.K, et al, 2002 in JAOT vol 19).

p. 11454: line 2+. An azimuthal gap of 240 degrees seems very large to me unless the measurements in the remaining sector are very good. Based on figure 3, I wonder if a CN value of 3-5 would have advantages? The example in Figure 7 does not help me because there is such a large difference between the CN=3 and CN=22 cases shown. I would suggest using a different example.

p. 11457: line 7. I do not think this wind speed precision is meaningful. As calculated, it is the expected precision if the same wind field was measured each 30 minutes for a year. However, the wind field is changing over the year.

p. 11458: line 5. Please clarify what is meant by "cyclic azimuth range"

p. 11460: line 2. While changing the PRF can move the unambiguous range to a higher altitude, there is a penalty in sensitivity (unless averaging time or other parameters are also adjusted). Weather radar's address this with tricks in the transmitted waveform. It may be worth making note of the sensitivity penalty.

p. 11460: line 9. It would be helpful to describe the lower measurement altitude of the 482 MHz wind profiler sooner in the paper.

p. 11460: lines 12-17. It would be helpful to rewrite the paragraph, making the language more standard.

p. 11461: I do not think Appendix A is necessary. These results for converting from wind components to wind speed and direction are well known, as are the propagation of error formulae.

p. 11462: I do not think Appendix B is necessary. Doesn't B4 simplify as sigma_speed / sqrt(N)? This is also a very well-known result that does not need to be presented.

p. 11466: Table 1. It would be useful to add more information to this Table. For example the unambiguous range of each remote sensor. The parameters used in finding the winds. The lowest measured range gate. Maybe others. Also, indicate the oversampling that takes place in the RWP.

p. 11468: Figure 1. I really like this figure.

p. 11469: Figure 2. The caption indicates this is from two measurement periods? I don't understand this. Also, is this example representative of the lidar performance? This is important if the result (SNR-threshold) is to be

used for all data.

p. 11471: Figure 4. Please indicate if the time-axis is UT or local.

p. 11476. Figure 9. Please use the caption to indicate the purpose of the red lines. Also, please clarify why the words "in principle" are used.

p. 11479. Figure 12. Please consider a more simple way to present this information. This is a lot on this plot, and it is hard to interpret. Also, the detailed information in the figure caption would fit better in the body text of section 4.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 11439, 2014.