

Interactive comment on “Assessment of virtual towers performed with scanning wind lidars and Ka-band radars during the XPIA experiment” by Mithu Debnath et al.

Anonymous Referee #2

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General Comments:

The paper addresses an interesting evaluation of wind measurements with sonic anemometers, a profiling lidar, 3 scanning lidars and 2 Ka-band radars. The data records are generally very short, especially for the radar observations and it thus remains a bit unclear if the observed accuracy can also be reached under more variable conditions. I think the paper still merits publication but I would like the authors to provide more information about why only ~2hrs of data are available for the radars and also expand the discussion by addressing possible limitations under different types of conditions. It would also have been nice to see some recommendations in the conclusions or outlook sections about how different types of instruments can be best combined in

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future studies for getting the most complete picture of boundary-layer processes. The authors only addressed the performance in terms of mean wind conditions while turbulent flow quantities are also very important characteristics. Could combining lidars with radars be helpful for also obtaining higher order velocity statistics?

Specific Comments:

p.3, 1. paragr. and p.4 l10-15: the authors mention that the measurements were performed over a period of $\sim 1w$, but then later state that the radar data were actually only available for $\sim 2hrs$. I find this quite misleading and the authors should be more specific here and also explain why the radars data were available only for such a short time window. What caused the radar data outside of this 2-hr window to be of poor quality and based on which criteria was it decided that the quality is acceptable/non-acceptable. Providing this information is critical as the reader otherwise does not know if the authors just picked a time period for which the agreement was best and excluded data for periods when the instruments were generally working but the agreement wasn't as good as expected. It would also be nice to add a short description of the general weather conditions for the day that was chosen for the comparison

p.4 the description of the instruments, the radars in particular, is rather short and possible limitations are not really discussed. What is the typical range of these instruments for different weather conditions, under which conditions do they not provide good data at all, etc.? Such information is very important and the authors should expand their description accordingly.

I would suggest combining Tables 1 and 2 into one table

p. 5, text below Eq. (1): it would be good if the authors can provide a reference for the error retrievals that are discussed here. Also, what was the reason for not having one of the scanning lidars continuously point vertically, which would have allowed to get much better observations for w ?

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p. 6 1. paragr.: what was the reason for the lidars not being synchronized and was there a minimum threshold for the overlapping time that was applied such that if the overlap time was below a certain value the data were ignored? Also, how high was the bias correction that was applied?

p. 8, l10-11: do the sonic data justify the assumption of a zero vertical velocity? I would suggest adding a panel with w-observations to some of the figures, such as e.g. Figure 7. It would also be of value for the discussion of the results in Table 7.

Figures 3 and 4: What are possible causes for the differences between the 2 sonics between 1320-1400UTC? The sonics do not seem to fall in the sectors where tower wakes could play a role during this time period.

p. 8, l 16: was the interpolation not applied to the data shown in Fig. 4? I would assume that the interpolation had to be first applied as the measurement heights would otherwise not match up but in the text it sounds like the interpolation was applied after these more qualitative comparisons.

p. 16, conclusions: given the short records of data the authors really must comment on how representative the observations and achieved accuracy are. Comments about possible challenges would also be helpful. The fact that only 2hrs of radar observations were found to be of acceptable quality lets me conclude that there may be quite a few challenges and for future studies and for deciding about the best strategies in obtaining boundary layer wind information a critical assessment of the pros and cons of different instruments is very important.

Technical Comments:

In several places (e.g. p. 5, l6-7) references are not placed correctly in parenthesis; the authors should carefully check and correct the references throughout the paper.

In the abstract, the word "performed" is used in several sentences and the authors should consider replacing it sometimes by a different word.

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p.1, l9: how did the authors decide that the accuracy was great, what are the criteria that are used for concluding about the quality of the agreement?

p.2, l30: the article "the" is repeated twice

p.3, l7: use "from" instead of "since"

p. 3, l10: CNR must be defined, also would suggest using SNR instead. It is defined in l 11 on p.5 but should be defined when it is first used.

Captions of Figs 3 and 4: the authors should add information about the date of the observations

Figure 3: it would be nice if the authors can mark/highlight the time period for which the radar data are available

Table 5: were data from the sonics within the tower wakes included or excluded in the statistical analysis, please specify.

p. 8, l7-9: I am not quite sure what the authors try to say here, could this be simplified to something along the lines of: Given the good agreement between the sonic anemometers and the profiling lidars we felt confident that the data sets from these two types of instruments can be used to evaluate the accuracy of virtual tower measurements with scanning radars and lidars?

p. 10, l12: light of sight should be changed to line of sight

p. 11, l10: would suggest finding a better word than "prefigured" such as e.g. "expected"

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