Atmospheric
Measurement
Techniques

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Discussions

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 #1

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General comments

This manuscript presents an evaluation of virtual towers from Dual-Doppler-Radar and Triple-Doppler-Lidar measurements with ultrasonic anemometers and a Doppler lidar wind profiler. While those measuring techniques aren't new and other evaluations already exist (and cited by the authors), a comprehensive evaluation like this wasn't published yet to my knowledge. The comparison of virtual towers from triple-Doppler lidars and dual radars is novel, but sadly also very short and only qualitatively due to data availability. It would have been really interesting to have the same level of detailed analysis there as for the comparison to the reference instruments.

I have done Dual- and Triple Doppler lidar measurements and retrievals myself and I

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didn't find major flaws in this work. The description of the measurement setup is mostly detailed enough for the purpose of the evaluation, but some information is missing (see specific comments). The authors use basic statistics for the evaluation and show the underlying data. The drawn conclusions agree to the data shown and can be followed.

With the disclaimer that I'm not native English speaking, I find the manuscript is well written. I noticed only a few minor mistakes.

Specific comments

Page 2, line 1: I think it would be a good addition here to explain briefly why Doppler lidars/radars only measure the line of sight velocity (or cite a work where it is explained).

Page 2, line 10: Maybe more precise "3D nature of the atmospheric boundary layer wind field"?

Page 2, line 14-16: The authors are clearly aware of this, but it should be written in the text that the accuracy of the retrieval is a function of not only the beam intersect geometry, but also the measurement errors of the individual instruments going into the retrieval.

Page 3, line 14: Does the 3 m leg spacing of the tower has any importance like less tower effects on the wind field?

Page 4, line 1-6: Please provide more information about this reference instrument (accuracy, serial number, year of production...).

Page 5, line 4: What was the pulse length of these two Doppler lidars?

Page 5, line 17 and 21: Accuracy or precision?

Page 5, table 3: What kind of errors (percentage, standard deviation) and do they have a unit? Also a sentence explaining that this is the error of a single lidar propagated through the rotation and being boosted up for small angles between the laser-beams could be considered here.

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Page 6, line 3-4: If the sampling period at each point was 25 seconds and there are 6 levels between 100m and 200m, than I would expect the total time for a virtual tower to be longer than 127s?

Page 6, line 7: I think it would be important to include information how the north orientation of the lidars/radars was determined, as this is very important for correct beam intersect.

Page 8, line 6: I associate the term confidence level with results of tests of significance in statistics, which were not made here. The authors might think about rephrasing with other words.

Page 8, line 15-17: This sentence is unclear to me. I understood: The profiles of wind speed and direction where vertically interpolated to the heights of the ultrasonic anemometers. Is this correct?

Page 11, line 16: Is there any reason to assume it wouldn't be working for higher velocities or does this statement just refer to the velocity range during the measurements?

Technical comments

Page 1, line 18-19: Sentence structure.

Page 2, line 3: Maybe write out atmospheric boundary layer? The abbreviation is not used later on.

Page 3, line 7: "from" instead of "since"?

Page 3, line 10: Abbreviation CNR not introduced yet (it is written out on page 5, line 11 later).

Page 5, line 6: Missing brackets for citation.

Page 6, line 16: Missing brackets for citation.

Figure 5b: Lines of identity and linear regression are behind data points.

Page 11, line 18: Remove crisply.

Page 12, line 1: Delete first "wind" in "retrieval of wind horizontal wind speed".

Figure 8b: Inconsistent rounding compared to table 7.

Figure 10: Labels on the color map of direction are missing.