

Review “High Resolution 3D Winds Derived from a Modified WISSDOM Synthesis Scheme using Multiple Doppler Lidars and Observations”

General remarks:

The authors took all of the major suggestions into consideration and added substantial analyses to the evaluation of the algorithm. The additional figures containing the comparison to the observational data now support the conclusions. However, I recommend to add to Figures 13, 15 and 17 b and c the control run as well. It is deemed to be the best performing setting, and this would greatly facilitate the comparison to the other experiments. If the control run is absent from the evaluation, it is still difficult to compare, whether the experiments in A, B and C performed better or worse than the control.

Moreover, the documentation and explanation of the algorithm has improved significantly.

While the language has improved substantially, there are still a number of phrasing issues and the manuscript would benefit from further language editing. Some of these are highlighted in the specific remarks.

Specific remarks:

The following line references highlight minor remarks. The line numbers refer to the revised, marked-up manuscript.

General language remarks:

- Many sentences begin with “Note that”, in most cases this can be eliminated and the meaning stays the same. Sometimes “note that” has been replaced with “notably”, which does not necessarily have the same meaning.
- It is often written that WISSDOM is “performed”. This is a rather unusual formulation for the use / execution / running of an algorithm.
- In the description of the results, the tense switches in between past and present.
- The sentences containing many brackets to show many different properties in the same sentence are hard to follow.

Line 16: The WISSDOM (...) synthesis scheme

Line 49: consider associating the scale directly with the phenomenon, e.g. from thousands (cold fronts and low pressure systems) over hundreds (tropical cyclones and typhoons) to a couple of kilometers (convective lines and TC rainbands)

For the TC rainband this naturally depends on whether it is the length or width of the rainband

Line 80: “Liou and Chang is the first purposes of this algorithm.” This sentence does not make sense. The following sentence (Furthermore, they performed IBM...) does not read smoothly either.

Line 112: ... can be used in the modified WISSDOM.

Line 113: ..., which is an essential benefit over Doppler radar data.

Line 134: “In addition, the modified WISSDOM was performed...” performed seems awkward in this context, perhaps execute, ran or used could be alternatives.

Line 136: The reliability of the derived 3D winds was also evaluated and discussed with respect to conventional observations.

Line 145: utilized instead of performed

Line 148: the effect of the non-flat surfaces? The topography itself is not generally affected by the algorithm, on the contrary, it affects the results of the algorithm.

Line 157: Note that V_t is first estimated based on the background of the sounding observations used in this study. In the absence of background observations, the first guess of V_t is set to 0.

Line 188: "In addition, individual constraints..." This sentence is difficult to read, please rephrase.

Line 216: "In this study, the time steps in WISSDOM..." -> In this study the time steps in WISSDOM are set to 12 min, corresponding to the temporal resolution of the primary input lidar data.

Line 304: "Notably, that the wind directions..." This sentence does not make sense.

Line 366: The Cartesian coordinate system

Line 425: They put more weight on observations and less on modeling inputs.

Line 428: variations instead of variances (unless you are referring to statistical variance)

Line 464: Remove "so-called"

Line 471: Do the 2.5 m/s refer to both horizontal and vertical wind deviation? For vertical velocities, this would be a rather large deviation.

Line 514: ...relatively larger IQR and median values can only be found at the lowest level...

Line 520-525: Example of switching tenses in the description.

Line 605: An additional test was designed, where only Doppler lidar data are used ...

Line 656-664: The distinctions made in the brackets here are rather confusing and hard to follow – it would be easier to read, if differing statements were made in separate sentences.

Line 665: More critical than what?

Line 719: "The conclusions indicated that the moderate setting..." Switching tenses, unclear conclusion - > is this the case with the smallest differences? B3 in blue cannot clearly be identified in Fig. 15. While naturally it is difficult to see all scenarios when they are so similar, it would be helpful to set B3 on top, if you want to highlight it in your discussion.

Line 722: helpless cannot be used in this sense

Line 742: Significant differences often exist in between the observations and reanalysis dataset due to the differing spatio-temporal resolutions.

Line 246: Superposed?

Line 761: The discrepancies in between the derived 3D winds in Experiment C and the sounding observations and QVP, respectively, were also examined.

Line 763: exceeding 20 m/s

Line 764 and 767: This would be easier to follow, if AWS, LDAPS and lidar impact were described in separate sentences.

Line 768: “not necessarily changed much” – in the context of a conclusion, this does not make a lot of sense here, please rather state if and how much they were changed.

Line 779: Emphasize the replacement of radar data and the separation of background wind information.

Line 806: Consider moving the reference to the DGW site to the sentence before. Interquartile range -> IQR

Line 827: raising -> rising

Lines 828ff: Please summarize your final settings in one clear sentence and highlight that they are the same as in the control run.