Dear Editors and Reviewer:

Thank you very much for your careful review and valuable suggestions with regard to our manuscript "Comparisons and quality control of wind observations in a mountainous city using wind profile radar and the Aeolus satellite" (Manuscript Number: amt-2023-152). The comments are helpful for revising and improving our paper. We have carefully studied these comments and made changes in the manuscript according to reviewer's comments. The main corrections in the manuscript and responses to the reviewer' comments are listed as follows.

General comments:

The observation of three-dimensional wind is of importance to weather forecast, air quality and renewable energy. The wind fields in complex terrain like Chongqing are affected by a variety of factors and thus difficulty to be simulated or predicted. Ground- and space-based wind measurements, such as wind profiler radar (WPR) and ALADIN onboard Aeolus, provide an unprecendented opportunity to obtain the vertical profile of wind. Nevertheless, the data quality of Aeolus or WPR in Chongqing remains unknown. The authors conducted comparison analysis used one-year worth of WPR, Aeolus and radiosonde measurements, and revealed some interesting phenomena. The data processing methods, as well as the comparison analysis, are basically scientifically sound. The topic fits in the scope of AMT, and this work is worth of publication in AMT after the authors have fully considered the following comments:

Response: We earnestly appreciate for the reviewer's warm work, and have made modifications according to the valuable comments. The details are as below.

Major comments:

1. Apparently, only the wind profile measurements from one WPR station (i.e., Shapingba) is used for verification with Radiosonde observations. If my understanding is right, the comparison analysis between Aeolus and WPR are based on the wind measurements from both WRP stations. But I can not find any descriptions for the WPR at Youyang. For instance, does it have the same frequency? Besides, how far is the WPR station at Youyang from the radiosonde site? the readers are more willing to know the locations of both stations relative to the Aeolus tracks (daytime and nighttime). Therefore, the authors can add one figure in section 2 to illustrate this, and clarify or discuss the potential impact arising from the dismatch of station location.

Response: Thanks for this valuable comment.

First of all, the comparison analysis between Aeolus and WPR is based on Youyang station. According to studies of Zhang et al. (2016) and Guo et al. (2021), Shapingba Station was excluded for comparison, because its distances to adjacent tracks of Aeolus exceeded 1°. The detail

description was given in the revised manuscript as “First, data verification and quality control effect analysis of the Shapingba WPR were implemented based on RS data. Based on the approach used by Zhang et al. (2016) and Guo et al. (2021a), the Aeolus data were removed once the distances between adjacent tracks of Aeolus and ground-based sites exceeded 1°. ”.

Secondly, for the description of WPR at Youyang, we have followed the suggestion and added some detail description in Section 2.1.1 Ground-based wind profile data. The WPR in Youyang share same temporal and spatial vertical resolution of 5 min and 120 m with Shapingba. And the distance of Youyang from radiosonde site in Shapingba is more than 360 km. The detailed description and figure in the revised manuscript is as below:

There are two wind profile radars in Chongqing, one at Shapingba station and the other at Youyang station (57633; 108.76° E, 28.84° N). Radars can operate almost automatically and continuously, acquiring vertical profiles of horizontal wind speed and wind direction (Guo et al., 2021a). The WPR in Shapingba and Youyang are from the same manufacturer, sharing the same temporal and spatial vertical resolutions of 5 min and 120 m, and vertically detecting 48 and 45 layers up to 9360 and 8910 m, respectively.

RS wind data are generally reliable vertical observations. Considering Shapingba WPR is located at the same station with RS, while Youyang Station is 360 km away from the RS, therefore, the data verification of WPR wind observations was conducted based on Shapingba WPR and RS data in this study (Figure 1).

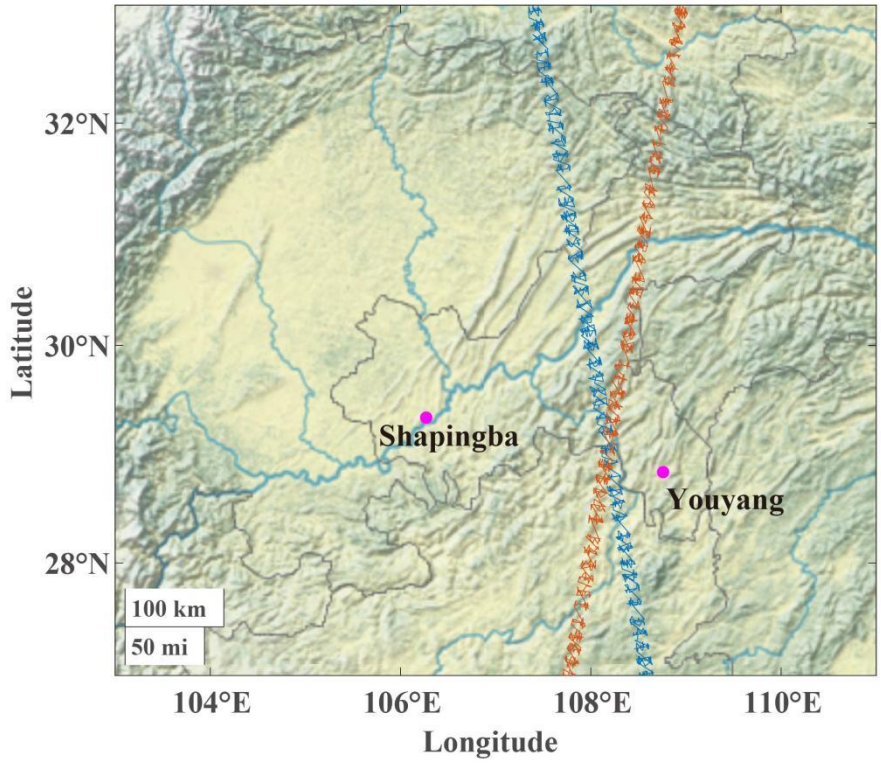

Figure 1. Geographic locations of ground-based wind observation stations and Aeolus tracks along within Chongqing. The magenta dots denote ground-based observation stations, while red and blue line represent Aeolus trackes. The backgroud is the terrain heights.

Finally, we have added Figure 1 to illustrate the locations of both ground-based stations and the Aeolus tracks, with Figure 1 in the revised manuscript. The discussion about the potential impact arising from the dismatch of station location was given in the revised manuscript as below:

"data verification and quality control effect analysis of the Shapingba WPR were implemented based on RS data. Based on the approach used by Zhang et al. (2016) and Guo et al. (2021a), the Aeolus data were removed once the distances between adjacent tracks of Aeolus and ground-based sites exceeded 1 ° . With this procedure, Shapingba station is not suitable for comparison with Aeolus data, whereas Youyang WPR data is. Time and space matches of the WPR and Aeolus data were posed before the comparison, the geographic location of WRP stations and Aeolus tracks are shown in Figure 1. "

2. Section 2.1.1 and 2.1.2 can be merged, and "Shapingba WPR is located at the same station as RS; therefore, the data verification of WPR wind observations was conducted based on RS data in this study." can be incorporated to the original section 2.1.2.

Response: We are appreciated for this comment and have followed this suggestion. The original Section 2.1.1 and 2.1.2 have been merged to be Section 2.1.1 Ground-based wind profile data. The

description in Section 2.1.1 in the revised manuscript has also been rephrased.

3. Figures: The X-axis and Y-axis scale in Figure 2 can be shortened to better show the details of scatters. For example, both axis can be adjusted to -20 to 40 m/s. Figures 2 – 5: only major ticks in both axes are shown. It is inappropriate for a high-quality figure not to show the minor ticks.

Response: We are thankful for the careful comment. Following this suggestion, we have adjusted the axis in original Figure 2 and added minor ticks in other figures.

Minor comments:

Line 12: "vertical wind" can be expanded to "vertical wind profile"

Response: Thanks for this kind remind. We have modified "vertical wind" to "vertical wind profile" in the revised manuscript.

Line 19-20: "Their root-mean-square deviation increased with height but decreased by 3 – 4 km." is not clear to me. For example, grammar error exists in "decreased by 3 – 4 km." Besides, I cannot find any figures in this manuscript can support this conclusion, and should be rephrased.

Response: We feel sorry for the unclear expression, and have rephrased this sentence as "Their root-mean-square deviation increased with height, but decreased at heights between 3 and 4 km." This conclusion is derived from Figure 6(a) in the revised manuscript, with the blue line illustrating vertical variation of RMSE between RS and the WPR. Please see Figure 6 and the corresponding description:

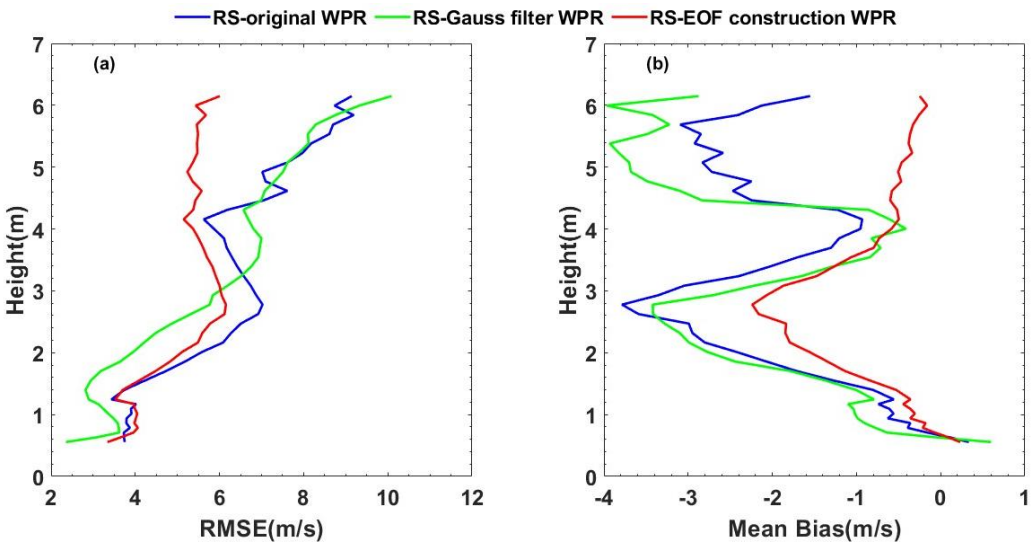

Figure 6: Vertical distributions of RMSE and MB for (a) RS vs GF WPR data, (b) RS vs EOFc WPR data.

Large negative deviations emerged on different layers, however, large positive deviations were mainly distributed around 3-5 km, with the maximum around 30 m/s. From the perspective of statistical parameters, the RMSE of RS and the original WPR deviation increased with height overall, but decreased at heights between 3 and 4 km.

Line 27: "between ± 5 m/s" can be revised to "within ± 5 m/s" or "between -5 m/s to 5 m/s"

Response: Thanks for this kind comment. We have revised the expression as "within ± 5 m/s" in the revised manuscript.

Line 28-29: Can you please clarify the specific characteristics in "the mean differences"? ? Otherwise, the sentence "the mean differences… below 1.5 km" makes nonsense.

Response: We are sorry for the lack of clarity and have rephrased the expression as "large mean differences of both Rayleigh-clean and Mie-cloudy winds versus WPR winds appeared below 1.5km".

Line 30: ", such that" can be modified to ". In this case" or similar expression.

Response: Thank you for the comment. We have followed it in the revised manuscript.

Line 31: "large mean differences of 4-8 km" can be rephrased to "Larger mean differences at the height range between 4 to 8 km".

Response: We are thankful for this comment, and have rephrased the sentence following the suggestion in the revised manuscript.

Line 43-44: "to study" -> "for studying…and predicting extreme weather."

Response: Thanks for the careful comment. We have modified "to study" to "for studying" in the revised manuscript.

Line 33: I wonder the logic behind "influenced by the topography of the Tibetan Plateau." Chongqing (the elevation is less than 4000 m) is in the southwest China, lying far away from the Tibetan Plateau (TP). Besides, do you have any evidence for the connection between cloud liquid water in the middle troposphere and the topography of Chongqing (not TP)? If not, this conjecture can be deleted.

Response: We are appreciated for the rigorous suggestion and have deleted this expression in the revised manuscript.

Line 84: "and three-dimensional spatial structure" can be removed.

Response: We are thankful for the suggestion and have followed it the revised manuscript.

Line 103: How about the accuracy of the RS measurement in Chongqing, or China? The authors

may refer to the following important papers:

https://doi.org/10.1007/s00376-010-9170-8

https://doi.org/10.5194/acp-16-13309-2016

https://doi.org/10.5194/acp-21-17079-2021

Response: Thank you for the recommendations. Referring to these papers, we have added some description about accuracy of RS measurement in China as:

"Shapingba station belonged to the network of the L-band sounding system by China Meteorological Administration. The operational radiosonde stations in China widely use GTS1 digital radiosonde as key components of L-band sounding system, which have high accuracy within the troposphere in detecting fine resolution profiles of meteorological factors (Bian et al., 2011; Guo et al., 2016; Guo et al.,2021)."

The corresponding references were also added in Reference.

Line 104: "Station Shapingba" -> "Shapingba"

Response: Thanks for the careful suggestion. We have made modification in the revised manuscript.

Line 156 and 174: "Where" should be revised to "where" and no indent before "where"

Response: We are sorry for the format errors and have corrected this kind of errors in the revised manuscript.

Line 213: "which drift more than 10 kilometers away from the releasing station", the drifting distrance of RS balloone depends on the altitude, and this expression can be revised by referring to Figure 2 in Zeng et al. JGR 2019 (https:// doi.org/10.1029/2018JD029109)

Response: Thanks for the recommendation. We have modified the expression referring to Zeng et al. (2019) as "which can respectively drift as far as 0-90, 2-25 and <10km at 200, 500 and 850hPa away from the releasing station (Zeng et al., 2019)" in the revised manuscript.

Line 67: Is the publication year in "Zhang et al. 2017" supposed to be 2015?

Response: Thanks for the kind remind. We have checked the publication year of the reference and correct it in the revised manuscript.

Sincerely,

Authors