Response to Reviewer 1's Comments

Response: We thank the anonymous reviewer for his/her comprehensive evaluation and thoughtful comments. We have addressed the reviewers' concern one by one. For clarity purpose, here we have listed the reviewer' comments in plain font, followed by our response in bold italics.

This paper examines the characteristics and performance of vertical wind measured by China Radar Wind Profiler Network. The topic is interesting and has climate implications in evaluating and using the wind observations with their reliabilities from Wind Profiler site over China. The paper is well organized and written. The findings of this study are worth of publication in the journal after minor revision. My comment on this paper is mainly related to the evaluation indexes used in the study, which may impact on some of the conclusions.

Response: Thanks for the reviewer's positive comments on our manuscript.

1. Which criteria are referenced for thresholds of the acceptable levels for these parameters including height, sample rate, confidence (Fig. 5), bias, and RMSE (Fig. 7) in the paper.

Response: Good question. In fact, no well-established criteria can be found in the current references for the setting of the parameters you mentioned. Generally, the criteria are formulated according to the needs of users. We hope to apply the radar wind profiler network data to continuous atmospheric boundary layer observations in the subsequent research. Therefore, it required that the effective detection height above 3 km, the acquisition rate above 60%, the confidence level reach 100%, the mean speed difference less than 4 m/s, and mean RMSD less than 6 m/s.

To clarify this issue, we thoroughly revised the following paragraph in section 3.1: "In order to make the criteria of RWP network data consistent, we have to set corresponding screening criteria for each system index, which to some degrees reflects the needs of future applications. For instance, the RWP network data are

expect to be used to derive boundary layer parameters, such as boundary layer height (Liu et al., 2019) and wind shear that are closely related to atmospheric pollution (Zhang et al., 2020). Therefore, it would be better for the effective detection height of RWP reaching 3 km, with the acquisition rate being above 60%. In addition, according to the user manual of RWP, only those wind profile data with a 100% confidence level are recommended."

Besides, in section 3.2, we rewrote the following paragraph:

"Here, the horizontal wind speed measurements at all levels ranging from 0 to 3 km are used to calculate the MSD and RMSD at each site. Moreover, the magnitude of mean speed difference (MMSD) and RMSD are set to be 4 m/s and 6 m/s, respectively, which serve as a target for acceptable criterion"

2. The ECMWF data set used for validation needs a brief introduction, including its uncertainty and reliability.

Response: Per your suggestion. By referring to previous studies on the assessment of ERA5 reanalysis, we added the following sentences in section 3. "In order to estimate the data accuracy, the wind profiles from RWP are compared with hourly wind measurements at 0.25 x 0.25-degree latitude/longitude grid from the fifth generation European Centre for Medium-range Weather Forecasts (ECMWF) atmospheric reanalysis of the global climate (ERA5, Hoffmann et al., 2019).

3. Note that South China Sea should be added in the Figures 1,3,4,7,8,910.

Response: Amended as suggested.

4. What does the "ABL" mean in the line 10 of the introduction? Acronyms must be explained in detail when the article first appears. Similar to MODIS at line 8 of page 11.

Response: The "ABL" refers to "planetary boundary layer (PBL)", which has been corrected to make it consistent throughout this manuscript. The "MODIS" is short for "the Moderate-resolution Imaging Spectroradiometer".

5. The word spacing at P3 L15 need to be modified.

Response: Amended as suggested.

6. For Figure 6, as stations in northwest show much difference with other stations in diurnal phase, any reason?

Response: If I understand correctly, you should refer to Fig. 9. We think these differences may be caused by differences in climate and terrain. Northwest China is a semi-arid and plateau region, but most other sites are distributed in the plains.

7. For better cover across the whole China, you should a station in the northwest to make comprehensive comparison with ECMWF.

Response: Per your kind suggestion, the Nanjing site in the eastern China was replaced Wulumuqi, one site located in northwestern China. Also, the Zhuhai site was replaced with Zigui.

8. at P10 L18, diurnal phase and amplitude of the mean maximum wind at different heights are almost same. Do authors have any ideas about the reasons that cause this phenomenon? So does the inconsistency for some northwest stations.

Response: Here, we present the statistical results of the diurnal phase and amplitude of the mean maximum wind at different heights. Due to the atmospheric wind field is affected by multiple factors such as vertical pressure, temperature gradient, terrain and climate. Therefore, it is hard to clarify the specific reason. We think it may be due to the downhill mountain winds or offshore winds.

9. You used some station names in the text or other figures (e.g., names in figure 6), so should add the locations of these names in figure 1 for readerships.

Response: Due to there are many observation sties in Beijing and Shanghai area, it is hard to add station name in the Fig.1. Therefore, we add the latitude and longitude of the six stations in text for readers.

10. Land use data from MODIS should be descripted in data section. Suggest that MODIS-based land use type should be added as background in Figure 10 for readerships.

Response: Per your suggestion, the land cover data and their description has been added in section 4.2 of this revision. Now it reads as follows:

"The MODIS Land Cover product is derived through a supervised decision-tree classification method. The land cover types are divided into 17 classes, including 11 natural vegetation classes, three human-altered classes, and three non-vegetated classes (Friedl et al., 2019)."

Moreover, the land cover data was added as background in the Fig.10.

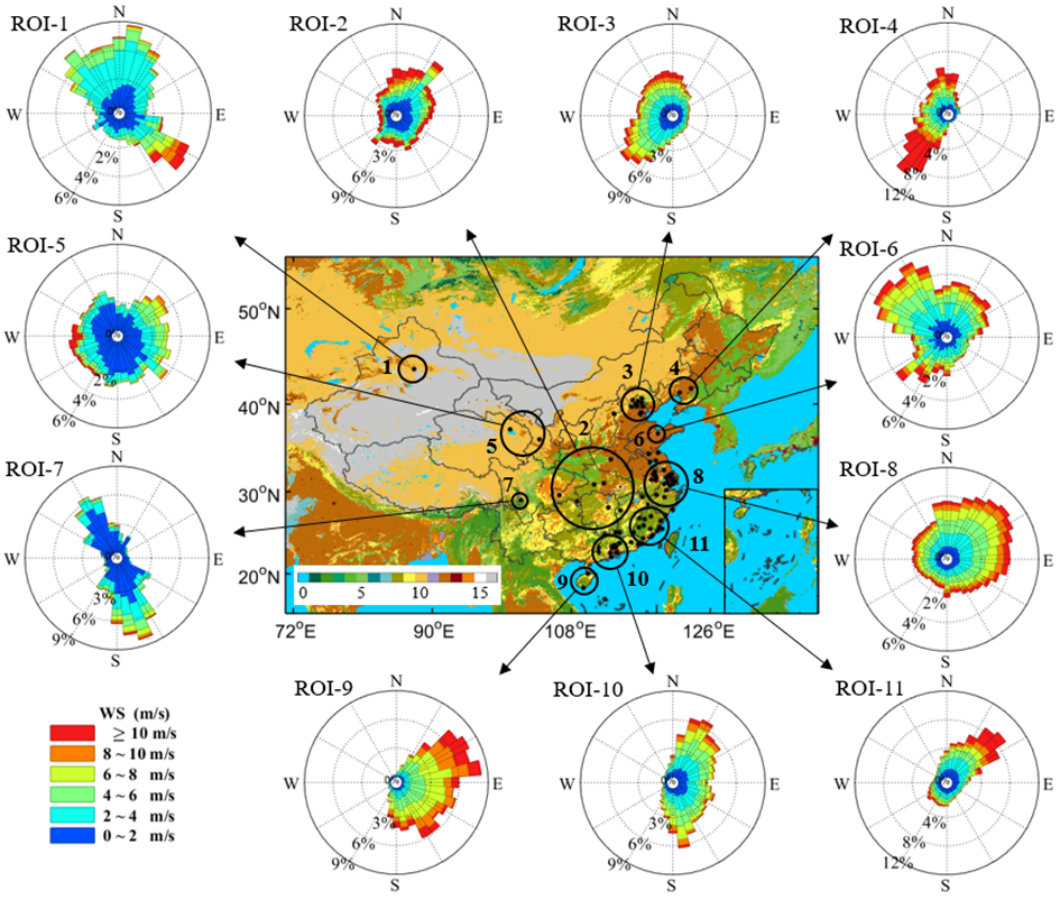

Figure 10. Spatial distribution of the statistical results of atmospheric wind fields at 500 m above ground level (AGL) for 11 regions of interest (ROIs). The wind rose plots over the 11 ROIs are calculated from hourly observations of wind direction and wind speed from November 2018 to March 2019. The land cover types 0–16 represent the Water, Evergreen Needleleaf forest, Evergreen Broadleaf forest, Deciduous Needleleaf forest, Deciduous Broadleaf forest, Mixed forest, Closed shrublands, Open shrublands, woody savannas, Savannas, Grasslands, Permanent Croplands,

Urban and built-up, Cropland/Natural vegetation mosaic, Snow and ice, Barren or sparsely vegetated, respectively.