Response to Reviewer #2's Comments

This Technical Note systematically compared the Mie-cloudy and Rayleigh-clear wind products from Aeolus measurements with wind observations from the radar wind profiler (RWP) network in China. The topic is very interesting and has important implications in evaluating the quality of Aeolus observation and applications over China regions. The paper is well organized and written. The findings of this study are worth of publication in the journal after minor revision as following:

Response: We greatly appreciated the reviewer's positive comments on our manuscript, which greatly improve the quality of our manuscript. We have made efforts to adequately address 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.

1. P4:" Over countries or regions with episodes of extensive heavy air pollution, such as China, the high aerosol concentrations could significantly affect satellite observations, which in turn can affect the accuracy of wind products and their applications in weather forecast and climate prediction." Some references should be added to support this deduction. How high aerosol concentrations could significantly affect satellite observations?

Response: The potential impact induced by high aerosols concentrations is at least twofold: On one hand, in the presence of dense smoke, dense fog, and haze, the laser energy of ALADIN/Aeolus, which is a spaceborne Doppler lidar, would be attenuated, making it unable to obtain near-surface observation signals (Winker et al., 2009). On the other hand, when the aerosol scattering signal is too strong, and thus the molecular scattering signal will be masked, which in turn impair the signals used to retrieve Rayleigh wind (e.g., Tian et al., 2008; 2017).

Per your suggestion, the above-mentioned descriptions have been incorporated into Section 1 in this revision as follows:

"In particular, in the atmosphere fraught with dense smoke, dense fog, and haze, the laser energy would be attenuated, making it likely not to well obtain near-surface observation signals (Winker et al., 2009). Moreover, when the aerosol scattering signal is too strong, the molecular scattering signal will be dramatically attenuated, thereby undermining the inversion of Rayleigh wind (Tian et al., 2008; 2017). For instance, many previous studies have shown that China experienced several episodes of severe haze pollution during the COVID-19 lockdown period, despite the widespread emission reduction (Huang et al., 2020; He et al., 2020; Le et al., 2020; Su et al., 2020)."

References:

Winker, D. M., Vaughan, M. A., Omar, A., Hu, Y., Powell, K. A., Liu, Z., Hunt, W. H., and Young, S. A.: Overview of the CALIPSO mission and CALIOP data processing algorithms, J. Atmos. Ocean. Tech., 26, 2310–2323, 2009

Tan, D. G. H., Andersson, E., de Kloe, J., Marseille, G., Stoffelen, A., Poli, P., Denneulin, M., Dabas, A., Huber, D., Reitebuch, O., Flamant, P., Le Rille, O., and Nett, H.: The ADM-Aeolus wind retrieval algorithms. Tellus A, 60, 191–205, 2008.

Tan, D., Rennie, M., Andersson, E., Poli, P., Dabas, A., de Kloe, J., Marseille, G.-J., and Stoffelen, A.: Aeolus Level-2B Algorithm Theoretical Basis Document, Tech. rep., AE-TN-ECMWFL2BP-0023, v. 3.0, 109 pp., 2017.

2. P6: "To achieve a synchronization, the time difference between the RWP and Aeolus wind profiles should be minimum". How do you define the minimum? Please clarify it.

Response: Good comment! The time difference between Aeolus and RWP profile is required to be within 10 minutes. We modified this sentence to: "To achieve a synchronization, the time difference between the RWP and Aeolus wind profiles is required to be less than 10 min.".

3. P7: What is the reason that you distinguished and employed ascending orbit and descending orbit data to discuss their accuracy? R fallen? May influence the comparison results?

Response: Good question! To the best of our knowledge, at least the following two concerns justify the distinguishing between ascending orbit and descending orbit data when comparison is performed.

First of all, IR and UV radiation, along with the aerosol and cloud, show significant diurnal variability, which is supposed to exert influence on the signals of Aeolus.

Second, the descending and ascending orbit data, corresponding to the sunrise and sunset times, are provided to the public separately, and thus the readers are eager to know their corresponding accuracy.

Actually, our results showed that there existed difference of the accuracy of Aeolus wind product between descending and ascending orbit data, justifying the validation methods used in our study.

4. P8-9: the variables in equations 4-6 should be clarified.

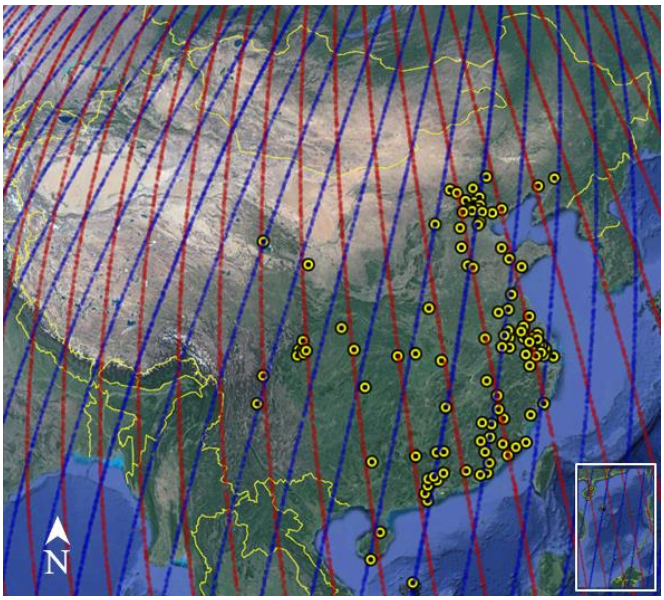
Response: Amended as suggested.

5. P24: Table 1 caption: 75km-radius–>75-km radius

Response: Amended as suggested.

6. Figure 1: The flag of geographic direction should added

Response: Per your suggestion, north* arrow *has been added in Fig.1.



7. Figure 3: The flag of geographic direction is unclear.

Response: The flag of geographic direction has been enlarged as suggested. See the following figure, please.