Response to the comments of Reviewers

RC1: 'Comment on amt-2023-235', Anonymous Referee #1:

Thanks for the authors to address my comments. I think the paper is suitable for publicaiton in AMT.

Response: We are very much appreciated for your scrutiny of our manuscript, and thanks for your comments.

RC2: 'Comment on amt-2023-235', Anonymous Referee #3

For a newly launched space-borne lidar, verifying its observations under different weather conditions can help improve its observation quality and serve the provision of subsequent data retrieval products. The manuscript uses the Belt and Road lidar network and CALIPSO satellite to verify TABC, VDR, extinction coefficient and lidar ratio obtained from the world's first space-borne high spectral resolution lidar ACDL initial observation, showing the good observation performance of ACDL under different typical weather conditions. The topic is of sufficient interest to the communities of study of laser remote sensing and atmospheric aerosol. In general, I find this manuscript to be of interest for publication and appropriate for Atmospheric Measurement Techniques. There are several suggestions for improvement listed below that should be considered by the authors and the editors before publication.

Response: Thank you very much for the appreciation of the work.

1. The title of the manuscript uses "space-borne". It is suggested to unify the "satellite-based" in the manuscript to "space-borne".

Response: Thank you very much for raising this concern. We have unified the wording throughout the entire manuscript.

2. The abbreviation (AEMS) in line 33 is not mentioned in the following text and can be deleted here.

Response: Thanks for your suggestion. We have deleted it.

3. In line 53, the "Observations" should be "Observation".

Response: Thank you very much for your suggestion. We have corrected it.

4. The second paragraph of the introduction describes the related validation work of the CALIPSO satellite, and it is recommended to describe it in chronological order according to the publication of the article.

Response: Thanks. The introduction part has been revised. Please see the lines 54-58.

5. Please double check the use of verb tenses in the introduction section to ensure consistency in the tense of the manuscript.

Response: Thank you very much for pointing out this mistake. We have standardized the verb tenses in the sentences.

6. In line 76, "section" should be "Section".

Response: Thanks. We have corrected it.

7. In line 78, "ground-based lidar network" should use "BR-lidarnet".

Response: Thanks. We have corrected it.

8. "In addition" in line 86 is repeated with "Additionally" in the previous sentence. It is recommended to change the word.

Response: Thanks. We have replaced it with "***Moreover***".

9. Regarding ACDL, ground-based lidar, and CALIPSO in Section 2, additional parameters for the lidar system could be added as appropriate. This can allow readers to see the differences between instruments more intuitively.

Response: Thank you very much for your suggestion. We have added more detailed parameter descriptions in lines 89-90 and lines 106-107.

10. It is suggested to unify the "background subtraction" in line 106 with Figure 2 and change it to "background correction".

 Response: Thanks. We have revised it.

11. At the beginning of Section 2.3, the full name "The Cloud Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO)" is already written in the introduction, and abbreviations can be used directly here.

 Response: Thanks. We have revised it.

12. The description of the observation time for the selected cases in lines 198 and 190 is redundant. It is recommended to delete it appropriately to simplify the expression. And one of the cloud cases compared is at night. Please verify in detail.

 Response: Thanks. Sentence has been revised with better clarity.

13. In line 199, check that the tense of the sentence is consistent with the following text.

 Response: Thank you very much. Sentence has been revised with better clarity.

14. In line 201, "Meanwhile, the air quality index (AQI) values of these two days in order are 43 and 45" should change to "Meanwhile, the air quality index (AQI) values of these two days are 43 and 45, respectively". Similarly, in line 206, add ", respectively" at the end of the sentence.

 Response: Thanks. We have revised it.

15. In line 232, please specify which "ground stations" it is.

 Response: Thank you very much for your suggestion. We have revised it as "*Zhangye site*".

16. The tense of the sentence in line 246 should be consistent with the following text.

 Response: Thank you very much. We have revised it.

17. In line 253, "The historical weather forecast also shows a cloudy condition over Zhangye on that day." It is better to change "forecast" to "record" here, because what has already happened cannot be called "forecast" anymore.

Response: Thank you very much for your suggestion. We have revised it.

18. Please double check the entire text, there should be a space between the unit and the number.

Response: Thank you very much. We have revised it.

19. The content starting from line 274 is different from the analysis of cloud cases, and focuses on studying the observation consistency between ACDL and ground-based lidar from a statistical perspective. Therefore, it is recommended to separate a section for discussion.

Response: Thank you very much for your suggestion. We have added a new section "*3.4 Comparison of ACDL and ground-based lidar observations*" to discuss the observation consistency between ACDL and ground-based lidar.

20. In line 274, the "affects" should be "affect".

Response: Thank you very much. We have revised it.

21. The descriptions in lines 289 and 292 regarding the selection of different weather conditions for individual cases are duplicated. Please revise these two sentences.

Response: Thank you very much. We have revised it.

22. The tense of the sentence on line 301 should be consistent with the previous text.

Response: Thanks. We have revised it.

23. In line 309, the "high spectral lidar" should be written as "HSRL".

Response: Thank you very much. We have revised it.