Dear teacher:

Thank you very much for your guidance and advice. We carefully read your suggestions, and revised the manuscript in accordance with your comments.

1. The reviewer's comment: In the noise removal phase, how much points were removed in the end? If it is 100 data points, 60 are removed at once and only 40 valid points remain. Can the results be trusted? The authors should add some quality control, such as removing 10 or less, the best quality, 30 are not credible, etc. I did not see the description in the paper.

The authors' Answer: Thank you very much for your suggestion and guidance. In the last review comment reply, we have explained this point. In fact, the noise point is not eliminated under the noise removal phase, but is judged as a cluster which same with the neighboring particles. In this way, it won't lose height information. Meanwhile, the class misjudgment caused by noise point is corrected. Therefore, in the noise removal phase, it does not need to add quality control. But this point did not explain clearly in the manuscript. To avoid misleading readers, we add some descriptions in the P5 line 3. "According to the noise removal principle, the category of noise point was judged as a cluster which same with the neighboring particles."

2. The reviewer's comment: Figure 9, this study shows the comparison between the BLHs from CALIPSO at 0210LT and RS at 2000LT. But the BLH has strong diurnal variances, this comparison is unreasonable. I suggest that the author change to RS data at night, or delete this comparison.

The authors' Answer: Thank you very much for your suggestion and guidance. As your said, due to the time mismatch, the comparison between the BLHs from CALIPSO at 0210LT and RS at 2000LT was unreasonable. So according to your suggestion, we delete the comparison between CALIPSO and RS. In addition, to make the results more robust, more CALIPSO profiles by different horizontal smoothing number was added

in Fig.9. The horizontal smoothing numbers of 1, 3, 6, 9, 12, and 15 (i.e., 1/3, 1, 2, 3, 4, and 5km in the along-track direction) are add to test the GDM algorithm, as the following picture shown.
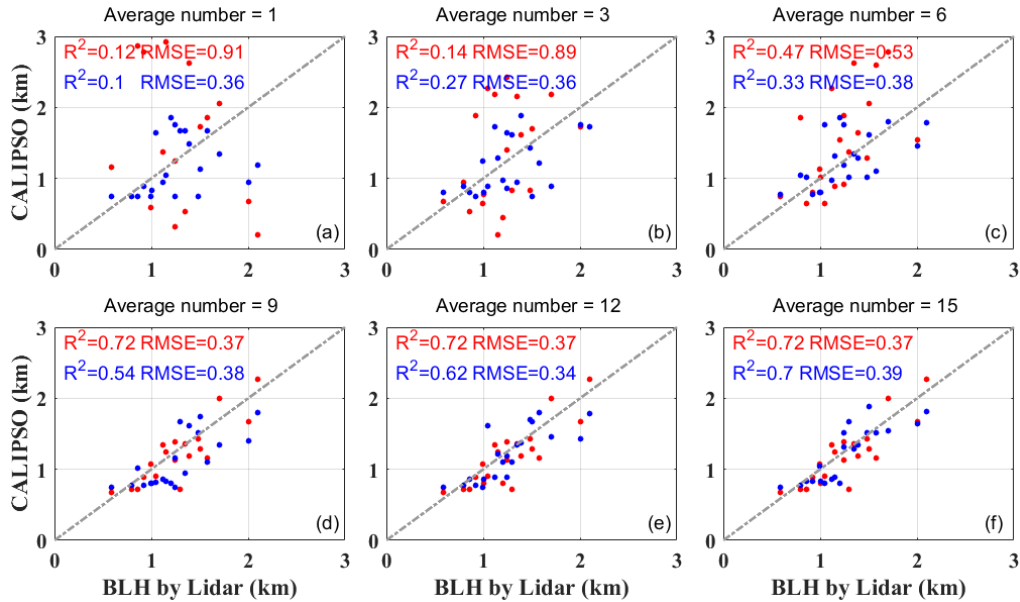
3. The reviewer's comment: The author claimed that they use nighttime data of CALIPSO and Lidar (0210LT), but the nighttime BLHs at 0210LT from CALIPSO and Lidar looks a little high. It may be due to the that the Lidar system regarded the top of residual layer as the BLH at night. So, the authors should explain it clearly.

The authors' Answer: Thank you very much for your suggestion and guidance. As your said, the structure of boundary layer is divided into a stable layer and a residual layer in the nighttime. The Lidar system obtained the boundary layer height based on the aerosol scattering profile. If the aerosol loading in the residual layer is large, the top of residual layer would be identified as the boundary layer height by Lidar. After our experiment, we found that the CALIPSO system was hard to identify the top of stable layer in nighttime. Therefore, the top of residual layer was defined as the boundary layer height in CALIPSO and Lidar system. It leads to that the BLHs from CALIPSO and Lidar are all a little high. About this question, more details would be added in the 3.2 section (Error analysis) to avoid misleading readers. Meanwhile, overcoming the effect of the residual layer on CALIPSO is our future work. According to your

suggestion, we add some descriptions in the P5, line 23-24. "In addition, due to the effect of the nocturnal residual layer, the top of residual layer would be identified as the BLH by Lidar system in some cases."

4. The reviewer's comment: About data collection time, the authors claimed that the number of residual CALIPSO data over Wuhan area was 49 after removing the cases with cloud and dust. The author should describe the continuous observation period for Lidar and RS, and indicate that how many cases have collected.

The authors' Answer: Thank you very much for your suggestion and guidance. I am very sorry that we did not describe clearly the time of data. The experimental time was from January 2013 to December 2017. During this time, the total number of CALIPSO crossing Wuhan were 93. After removing the cloud cases, there were 49 valid samples. Moreover, the ground-based Lidar and RS data were collected at the same time. The number of the ground-based Lidar and RS data matching CALIPSO data were 21 and 49, respectively. According to your suggestion, the descriptions about continuous observation period for Lidar and CALIPSO were added in the P3, line 19-21 and 30-33. "The Lidar data was collected from January 2013 to December 2017. After matching the CALIPSO data, the valid number of the ground-based Lidar data were 21 cases." "The data collection time was from January 2013 to December 2017. During this time, the total number of CALIPSO crossing Wuhan were 93. After removing the cloud cases, there were 49 valid samples."

5. The reviewer's comment: The principle that satellite data matches the ground station did not appear in the paper. The authors should clarify the match distance range and time range between the CALIPSO and the ground lidar (RS). Because the returns trajectory of CALIPSO is not completely coincident. It is necessary to point out the match distance range and time range.

The authors' Answer: Thank you very much for your suggestion and guidance. About the matching principles of ground-based Lidar and CALIPSO, we have explained it in two aspects. First, the distance between CALIPSO and ground-based Lidar stations is within 50 km. Moreover, the ground-based Lidar data were obtained within 30 min of CALIPSO overpass times. According to your suggestion, we add the descriptions in in the P3, line 7-10. "About matching principles of ground-based and space-borne Lidar, the distance between CALIPSO and ground-based Lidar stations is within 50 km. Meanwhile, the ground-based Lidar data were obtained within 30 min of CALIPSO overpass times."

6. The reviewer's comment: P2, Line 2: RS is the abbreviation. It should give the full name when it first appears.

The authors' Answer: Thank you very much for your suggestion and guidance. In here, the RS refers to radiosonde. According to your suggestion, its full name was given in the P2, line 3.

7. The reviewer's comment: The English of the paper should be improved.

The authors' Answer: The authors' Answer: Thank you very much for your patience and guidance. I am very sorry for my poor English expression. To improve the poor language, I have get a professional language editing service to correct the language.

Many grammatical or typographical errors have been revised.

All the lines and pages indicated above are in the revised manuscript. Thank you for the kind advice.

Sincerely

yours, Boming Liu