

## **Authors' responses to Reviewers' comments**

**Journal:** Atmospheric Measurement Techniques

**Manuscript Number:** AMT-2023-78

**Title:** An ensemble method for improving the estimation of planetary boundary layer height from radiosonde data

**Authors:** Xi Chen, Ting Yang, Zifa Wang, Futing Wang, Haibo Wang

---

### **Anonymous Referee #1:**

#### **General comments:**

It has been well recognized that the estimate of planetary boundary-layer height (PBLH) from radiosonde varies dramatically by the methods used, especially at the morning and evening transitional period. To reduce the inconsistency between existing methods, this manuscript by Chen et al. proposed an ensemble method to confront this challenge based on one year worth of high-resolution radiosonde measurement at Beijing weather station. This algorithm has solid physical basis. The analysis methods are scientifically sound, and the results are reasonable from my point of view. The manuscript is well organized, and figures and tables are presented in a succinct way and easy to follow. Nevertheless, the effectiveness of this method seems elusive to me, and thus further clarification is needed. Therefore, I recommend this manuscript be accepted after a minor revision. The specific comments are as follows:

#### ***Authors' response:***

We thank the Reviewer for her/his valuable comments and detailed corrections for our manuscript. We have considered the detailed comments and responded orderly as listed below.

#### **Major comments:**

1. "the effectiveness of the ensemble method" appears several times through the whole

manuscript. But I can not find the exact definition for EFFECTIVENESS. For the benefit of readership, necessary clarification for this noun is required. Therefore, the authors are suggested to give an unambiguous definition for EFFECTIVENESS with some explanation for its implication?

*Authors' response:*

We thank the reviewer for the valuable suggestion. We consider the result to be valid when the error between the result of the corresponding method and the PBLH with visual validation is less than 50 m. The effectiveness represents the proportion of the valid samples to all samples. The clear definition for effectiveness ( $E$ ) has been added in section 3.2 to help readership comprehend. Besides, “effectiveness” is replaced by “ $E$ ” in the rest of the manuscript.

Page 11, Line 250-252:” *If the error between the result of the corresponding method and the truth PBLH value is within 50 m, then the result will be considered valid. So, the effectiveness of each method is defined as following:*

$$E = \frac{\text{number of valid samples}}{\text{number of all samples}} \times 100\% \quad (3)''$$

2. Figure 9: I do not understand what does the Y-axis on the right-hand side of panel (a) and (b).

The authors can clarify this in the figure caption or in the main text.

*Authors' response:*

We are sorry for not specifying the axis information in Figure 9. The yellow solid circles in panel (a) and (b) represent the time of sunrise and sunset, respectively. We have changed the Y-axis label on the right-hand side to “Sunrise/Sunset (BJT)”, and a more specific clarification

has been added in the figure caption.

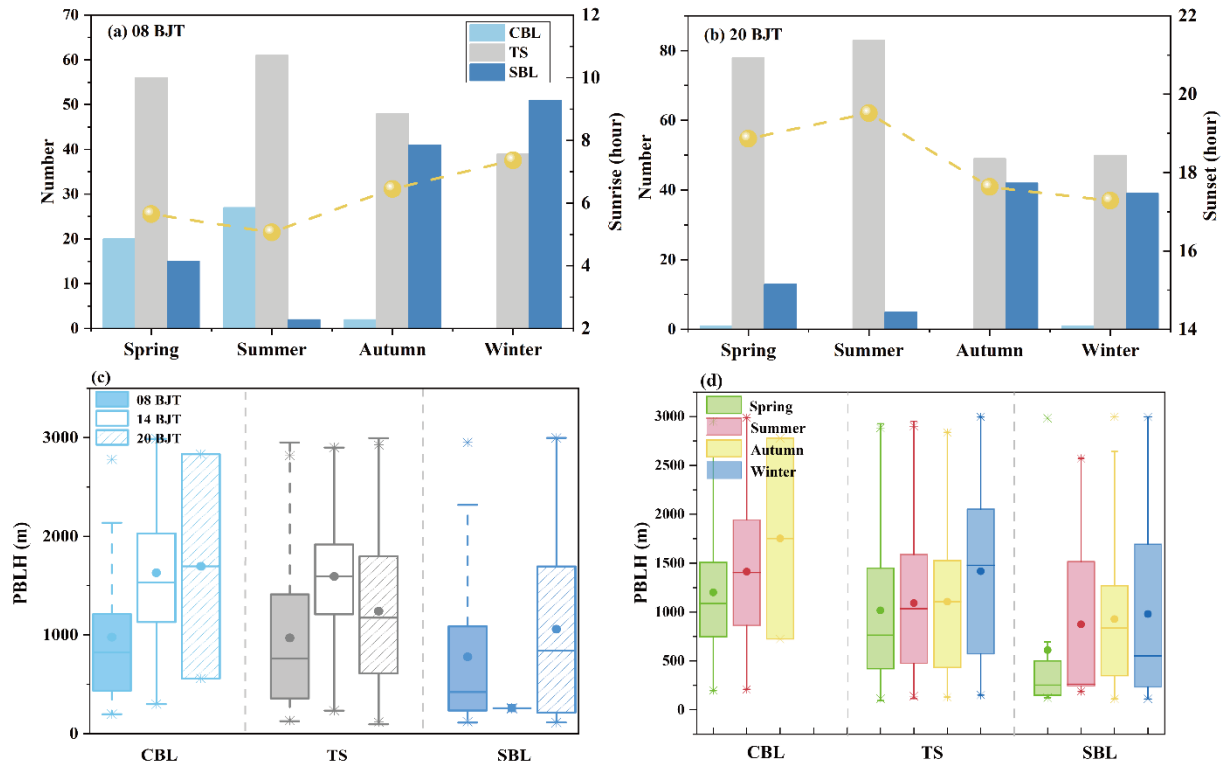


Figure 9: Histograms of occurrence number of three PBL regimes in different seasons at two routine observation times of (a) 0800 BJT and (b) 2000 BJT. The yellow solid circles in (a) and (b) represent the average time of sunrise and sunset in BJT and correspond to the right Y-axis. Box-and-whisker plots of three regimes of PBL at different (c) observation times and (d) seasons (only routine observations at 0800 and 2000 BJT are included). The dot in each box indicates the mean value of PBLHs and the cap represents the outlier.

**Minor comments:**

L19: “during afternoon, morning, and evening transition periods, respectively.” can be rephrased as “at 0800, 1400 and 2000 Beijing time”

We rephrased the sentence according to the suggestion.

L25: what does CBL stands for? For its first appearance, the acronym is supposed to be given

a full name.

CBL stands for convective boundary layer. We apologize for not defining the acronym when it was first used, and the revision has been made in the manuscript.

L27: It is better to use an adjective to describe the EFFECTIVENESS of the ensemble method developed in the present study.

According to the suggestion, the sentence has been rephrased as “These findings imply that the ensemble method is reliable and effective.”

L36: “with the free troposphere” can be revised to “between the free troposphere and ground surface”.

Changed according to suggestion. (Page 2, Line 36)

L47: the dash line in “wind-profiler” can be dropped.

Changed accordingly. (Page 2, Line 48)

L73: “As the routine radiosonde generally operates” -> “As the routine radiosonde measurements are generally taken”

Changed according to suggestion. (Page 3, Line 73)

L77: “further understanding of the transition period” -> “further understanding of the PBL structure and evolution during the transition period”.

Changed according to suggestion. (Page 3, Line 77)

L238 and 245: “the integrated method” is used instead of “the ensemble method” that appear in the title of this manuscript. Are there any differences between them? If not, I suggest the authors use one term through the whole manuscript.

Thank you for pointing this out. There is no difference between “the integrated method” and

“the ensemble method”. We have made revisions in the manuscript to make sure that only one term is used throughout the whole manuscript.

L334: “an accuracy estimation” -> “a reliable estimation”

Changed according to suggestion. (Page 17, Line 340)

L336: “first” can be removed.

Changed accordingly. (Page 17, Line 342)

L367-368: “and that results in some shortcomings of these methods being retained” can be rephrased.

This sentence has been rephrased as “On the other hand, some shortcomings of the existing methods may be retained in the ensemble method.”