Response to the editor's comments

General comment:

The review still raised the following issues: The manuscript have been revised according to the reviewers' suggestions. Although this study is about the statistical analyze of BLH and atmospheric variables, it is better to discuss more about the physical mechanisms behind the statistical results.

Response: Thank you very much for your time and effort. The manuscript has been modified carefully and seriously according to the editor's comments.

Specific comment:

1) Even only measurements of cloudless sunny days are analyzed, the impact of synoptic forcing cannot be ignored. For example, the subsidence of anti-cyclone can suppress the development of BLH (Liu et al., 2013). There are 42 cloudless sunny days in this study, the synoptic condition can be easily classified by using some reanalysis data or the synoptic chart of China Meteorological Administration.

Response: Yes. Liu et al. (2013) made a case study in the megacity Beijing, China, and showed that the subsidence of anti-cyclone can suppress the development of BLH. However, on time scale the Synoptic condition affected the boundary layer in days, but in our study, we analyzed the development of boundary layer every hour, and the restriction of the Synoptic condition in hours is not very significant. So for the correlation between BLH and variables, we didn't take the synoptic condition into consideration . But for the cases analysis, through surface pressure at 14:00 BJT we analyzed the impact of synoptic forcing on the four typical cases in different seasons (see the revised version of manuscript, Figure 2, Lines 264 to 274).

2) The development of BL is directly caused by the thermal convection and mechanical turbulence. It is better to calculate the surface sensible heat flux (SH), and then investigate how the SH affect the development of BL. The SH can be calculated by the using the measurements of meteorological tower. In addition, the mechanical forcing cannot be ignored.

Response: Yes. We have calculated the surface sensible heat flux (SHF) through surface temperature, surface air temperature and surface wind speed and investigated the effect of SHF on the development of boundary layer in the revised manuscript.

Please see the lines 108 to 110, 348 to 356 and other parts.

3) The aim of this study is to provide information for assimilation of BL. Therefore, the progress of BL assimilation needs to be presented in the introduction, and how the results of this study can be used in the BL assimilation should also be addressed.

Response: Yes. For "how the results of this study can be used in the BL assimilation should also be addressed", we have described that for BLH assimilation in the numerical model, what should be mastered is that which variables well correlate with BLH, as well as how far the influence radius of variables is in the horizontal, vertical directions and in time domain. So the results that variables well correlate with BLH and correlation law in time and space can provide basis and support for BLH assimilation, for example, the variables that correlate well can be assimilated into model as observations to adjust the initial conditions and then improve the BLH assimilation (see the revised manuscript, Lines 110 to 123). For "progress of BL assimilation", the traditional methods are Ensemble Kalman Filter and three-dimensional variation methods, the specific progress of BL assimilation is different

for different methods, and what method would be selected to assimilate BLH will be determined in the future.

4) This study merely focus on the daytime BL development, which should be explicitly described in the title and abstract.

Response: Yes. We have emphasized the daytime BL development and described in the title and abstract (see the revised version of manuscript, Lines 1, 46).

5) The author should improve the language and overall flow of the text.

Response: Yes. I have improved the language and overall flow of the text tried my best, however, some parts of the study may be still poor writing, but there is not enough time for professional language editing services and we will make further improvement with professional language editing.

6) Conclusion section, "The curve fitting method is suitable for retrieving BLH from lidar backscatter intensity on cloudless sunny days", this sentence is not the main finding of this study. Such a sentence should be presented in the "introduction" or "method" section with proper references.

Response: Yes. We have deleted the sentence "The curve fitting method is suitable for retrieving BLH from lidar backscatter intensity on cloudless sunny days" in the conclusion section. Besides, the advantages of the method have been described in the "introduction" section (Lines 95 to 98 in the revised manuscript). And the Time–altitude cross-sections of the backscatter verified that the curve fitting method is a value choice in the study(Line 279 to 282)

7) Only the differences of BL in summer and winter are presented, how about the typical BL development in spring and fall? Also I don't think the authors addressed

the previous comments appropriately, particularly: 1. Improve the writing and better literature review to address "This study is scientifically not new, and it is not clear with its originality and novelty" by reviewer 1 and many other issues. Again, please improve the writing! use short sentences, and flow logically! For example, the 1st sentence in the abstract is too long and unclear!

Response: In the revised manuscript, four typical cases: 15 July 2007, 20 November 2007, 4 January 2008 and 9 April 2008 were selected for four seasons. Because some of the data is not available during September and October 2007 and there were less sunny days in the fall, so the case 20 November 2007 lack representativeness for the fall typical BL development (Section 4 in the revised manuscript). For the writing, as described in answers to question 5, we will make further improvement in language editing with the professional company.