Atmospheric
Measurement
Techniques
Discussions

Interactive comment on "Mixing height derivation from aerosol lidar using machine learning: KABL and ADABL algorithms" *by* Thomas Rieutord et al.

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This article relates a study dedicated to evaluate the performance of two algorithms based on machine learning for retrieving the ABL height from lidar observations. To this end, the study makes use of a 2-year series of observations acquired by two lidars operating at two different locations. From these observations the authors retrieve the ABL height using KABL and ADABL algorithms and compare them with those obtained from radiosondes measurements (taken as reference). Based on this comparison the authors argue that better results are obtained with ADABL approach, although indicate that KABL can be easily adapted for 'other instrumental device'. The manuscript is not concisely written, and lacks scientific novelty and significance, or at least in the way it is written. The description of the methods is rather confusing and the authors make use of a large number of brief sections that are not well presented and discussed (e.g.

section 5). The authors also fail to demonstrate their main conclusions about the two algorithms. Specific comments and suggestions are given below:

- The abstract lacks of motivation. Currently, there are a number of different methods to retrieve the ABL from lidar observations, whose results have been widely tested. Why should we use KABL and ADAABL algorithms?

-The abstract states that "ADABL algorithm is performing better than KABL...". However, the authors do not indicate what they mean with 'performing better', or based on which results. In addition, the comparison uses radiosondes that always launched at the same time. How might this affect the study findings?

-Radiosonde data section, last sentence: 'After testing some of these methods on our dataset, we chose to derive boundary layer height with parcel method for the 11:15 sounding and bulk Richardson number for the 23:15 one.' Since the ABL height retrieved from radiosonde data is taken as reference in this study, the authors must explain why the parcel and Richardson methods were chosen. Also, they must explain how these different methods were tested.

-Section 3.1.2 and figure 4: The authors state "For few days where the boundary layer is easily visible for a human expert, the boundary layer top is drawn by hand: all points below this...". I do not believe this is a criterion to estimate the ABL height. I suggest to use some of the other methods that have been previously tested and used in the literature.

-Figure 9 shows the RMSE and correlation obtained from their comparison. However, nothing is said regarding RMSE. How did they calculate it? How is it defined? What are the errors of the radiosonde and lidar retrievals? Does the correlation depend on the ABL height? Also, it is said that a number of cases were not included in the analysis as a result of the meteorological conditions. How many cases? Are the retrievals affected by the meteorological conditions, why?

In summary, the overall comparison is incomplete and does not convincingly demonstrate their main conclusions.

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