

Interactive comment on “Mixing layer height retrievals by multichannel microwave radiometer observations” by D. Cimini et al.

Anonymous Referee #1

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The purpose of the manuscript is relevant to the journal, as it is pointing out a new instrumental technique to retrieve mixing layer height from a multichannel microwave radiometer. This is an added-value product for the new constituting microwave radiometer networks. However, the description of the method it is not clear and further analysis is needed to improve the general understanding of the manuscript to make it suitable for publication.

Major comments:

It is completely missing an analysis on stability of the retrieval algorithm. If both training and out-of-sample databases are changed in dimensions, how this will affect the results?

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Training the algorithm separately month-by-month is statistically risked. This choice is not justified in the paper. What is the impact on results if, for example, the training is done separately night from day-time? Or seasonally?

It is not mentioned the uncertainty in Tb measurement. Moreover, given a certain error in Tb, how it translates into MLH retrieval? How is the training affected?

Tb from lower elevation angles (let's say up to 19 degrees) results from different sounded volumes respect to the lidar pointing vertical (I am assuming it, but it is not specified anywhere in the paper). How these Tb measurement weight on retrieval?

An operational algorithm should be robust and work under different meteorological condition. I suggest to show some results of how the MLH retrieval by MWR under diverse atmospheric and meteorological conditions (no wind, strong wind, clear sky, boundary layer clouds, high aerosol load...)

Specific Comments

ABSTRACT

"...full overlap limit (=200m)". This statement it is not correct. ALS450 is set up for upper troposphere studies. Full overlap is reached more realistic at 350m (Lolli, S. L. Sauvage, I. Stachlewska, and R. Coulter, 2008: Assessment of the EZ LIDAR and Micro Pulse Lidar (MPL) performances at ARM Southern Great Plains (SGP) Central Facility for the measurement of clouds and aerosols, Geophysical Research Abstracts, Vol. 10, EGU2008-A-11091). Even if identical instruments may have slightly differences, 200m full overlap is way too optimistic.

INTRODUCTION

p. 4974, line 26. Modify the sentence to read: "Thus, this approach is independent of..."

MWR Data

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p. 4977 line 15: Modify the name to read : "Löhnert"

LIDAR DATA

"MLH is derived from lidar backscatter data". Is it the backscattering coefficient profile or the range corrected signal as I am supposing? Please specify.

STRAT2-D provides 4 different layers, but there is not an explanation about the criteria on how the "recently upgraded algorithm" picks up the MLH (if the profiles with rain are discarded, case of boundary layer clouds...). A brief explanation is needed to make the paper more clear.

"A variance analysis is performed on the lidar backscattering profiles" Again, is here referred to the aerosol backscattering coefficient? How is it retrieved? Or is it the range corrected signal? In this hypothesis, the variance is not a good indicator of stability, as the ALS450 lidar signal is not normalized to the laser energy, and especially during the warmest hours, the laser may have some fluctuations in energy.

METHODOLOGY See Major Comments

RESULTS

"However, lidar system performances have some impact on optical overlap factor". This statement is wrong, as the overlap function depends only optical geometry of the system (the field-of-view of the laser beam and the field-of-view of telescope). The atmospheric conditions are different, and sometimes (for example during high aerosol load or high humidity) some stronger signal is detectable from lower range bins. But still, this signal is in a region where full overlap is not reached.

How is reliable the training from MLH retrieved in a region where full-overlap is not reached? Lidar data under 350m should be corrected with the measured overlap function to be used.

SUMMARY AND CONCLUSIONS

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see RESULTS about the possibility of detecting MLH under 200m

"showing a consistent seasonal variability" This is a dared statement, as the dataset is not climatologically significant

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