

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2022-14

Anonymous Referee #3

Referee comment on "Atmospheric boundary layer height from ground-based remote sensing: a review of capabilities and limitations" by Simone Kotthaus et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-14-RC2>, 2022

The paper "Atmospheric boundary layer height from ground-based remote sensing: a review of capabilities and limitations" by Kotthaus et al., provides a summary of state-of-art boundary layer height estimates using ground based remote sensing systems. Such reviews are important as there has been significant development in novel techniques and instruments, and many papers go un-noticed unless highlighted by such a review. The authors have done a really nice job going into details of PBL definitions (some clarifications needed), type of instruments, new algorithmic developments and current deficiencies.

The reviewer does have some additional clarifications, and comments which would be helpful if addressed in the revisions.

Major Comments:

- Definition of ABLH is mostly provided from a lens of onshore applications or land-based ABLH, how do these definitions hold up in an offshore marine boundary layer? There needs to be some discussion on that front in the initial sections (Section 1.1).
- In Figure 3, it is indicated that the vertical velocity variance estimates can be used to estimate the stable boundary layer depth, the reviewer is not aware of many papers discussing/showing that methodology (except for Pichiguina and Banta 2010). So not a widely accepted methodology, as the vertical velocity variance is very low during nighttime conditions. Please provide appropriate citation for other references or reconsider this statement.
- The latest COSMIC-2 satellites have better spatial and temporal resolution and can provide better boundary layer height estimates compared to legacy COSMIC/other RO satellite data. Please mention something about COSMIC-2 to the reader, I don't see that in the article.
- Table 2, Network operation, the Atmospheric Radiation Measurement (ARM) network is

missing in the list.

- What is the importance of knowing ABLH during daytime or nighttime transition periods? That needs to be discussed, as models tend to deviate significantly during those time periods. Do we expect a given instrument to perform well during those transition periods?
- For DWL, another issue is the power of a given scanning Doppler lidar to reach the boundary layer. Some low powered scanning DLs fall short of reaching the ABLH during convective conditions, due to attenuation of the signal, increased Cn2 effects, instrument noise, etc.
- The NY Mesonet network in the US is missing: http://www.nysmesonet.org/data/profiler#stid=prof_alba. They have DLW and MWR profilers.
- Offshore ABLH should be given a separate section here, as there are challenges in measuring them due to trapped aerosol layers, internal boundary layers, coastal effects etc.
- ABL climatology sections seems out of place here. Once you define these advantages and disadvantages, the climatology will be digested with a "grain of salt" by the reader. Unless you put some uncertainty plots etc. I would encourage the authors to reconsider this section. Perhaps another climatology article would be most appropriate. This would also reduce the length of the article.

Minor Comment

- I am not a big fan of Table of contents for a journal paper but will leave it to the editor to decide. Figure 1 encapsulates this nicely.