

Atmos. Meas. Tech. Discuss., referee comment RC2
<https://doi.org/10.5194/amt-2021-142-RC2>, 2021
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Comment on amt-2021-142

Anonymous Referee #1

Referee comment on "Evaluation of convective boundary layer height estimates using radars operating at different frequency bands" by Anna Franck et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-142-RC2>, 2021

Review of "Evaluation of convective boundary layer height estimates using radars operating at different frequency bands" by Anna Franck, Dmitri Moisseev, Ville Vakkari, Matti Leskinen, Janne Lampilahti, Veli-Matti Kerminen, and Ewan O'Connor

Overview

In this manuscript the authors present a method for determining boundary-layer height from clear-air radar returns during the summer months. They test this method using data from collocated vertically pointing cloud radars at three different frequencies in Hytiälä, Finland and compare the resulting BLH values between the three radars as well as with ERA reanalysis and lidar-derived boundary-layer heights.

General comments

This paper is interesting and well written. It is great to see more researchers making use of the insect 'clutter' on cloud radars. The method described in the manuscript is robust and should provide a good platform for future studies in other areas or over a more extended time period. The figures are clear and helpful to the reader.

I have only minor comments and a few technical corrections that should be addressed prior to publication.

Minor comments

- L147: Suggest also including Luke et al. (2008) here [Luke, E. P., Kollias, P., Johnson, K. L. and Clothiaux, E.E.(2008) A technique for the automatic detection of insect clutter in cloud radar returns. Journal of Atmospheric and Oceanic Technology, 25, 1498–1513]
- In the schematic shown in Fig. 3, following in from the 'how many Bragg pix around' box, the options are >4 or <4 . What happens if there are $=4$ Bragg pixels surrounding the pixel in question? Or should one of the options in the figure read ≥ 4 or ≤ 4 ? Similarly, the situation when $LDR = -14$ or $Ze = -5$ are undefined, so maybe there should be a \leq or \geq in those boxes somewhere too?
- How was the 0.5 m/s threshold between passively or actively flying insects determined? Was this done visually based on Fig. 5, and were other threshold values tested to see how much difference this value made?
- Since it is generally thought that the threshold temperature for insect flight is closer to 10 degrees C (e.g., Drake and Reynolds 2012), how does this impact your data? Do you think that part of the cause of the method not working as well during the morning transition might be due to the temperature at the CBL top being lower than 10 degrees C?
- You mention that Wood et al. (2009) find that insects are sometimes present at heights beyond the CBL top. This effect is also visible in Banghoff et al. (2018) and Contreras and Frasier (2008). How would you expect the presence of insects above the CBL to impact the performance of your algorithm? This seems to more commonly occur in regions with high temperatures and I appreciate that it may not have occurred in your dataset, but it is an important consideration for researchers who would like to apply this method in regions with very high summertime temperatures.

Technical corrections

The following list provides suggested corrections for several minor technical or typing errors.

- L37-38: "Doppler lidars are also limited"
- L40: "due to large gradients"
- L52: "are of main interest"
- L54: "Since the 1970s"
- L56: "insect echoes"
- L58: "More recently, Chandra et al. (2010)"
- L64: "In recent years"
- L70: "insect echoes"
- L71: "compare the consistency"
- L71: "observed by the C-band radar"
- L95: "The radar uses a 0.5 ms pulse"
- L104: "this cloud radar also provides LDR measurements"
- L132: "steady ascent and descent"
- L145: "For mm-wavelength radars"
- L146: "to act as volume radar targets"
- L176: "from the insect echoes"
- L195: "is shown in Fig. 4"
- L206: "we set a value of 0.5" - please add units here

- L230: "during the descent"
- L281: Should these values of R be R^2 ?
- L307: "corresponds to the CBLH"