

Interactive comment on “Improved mixing height monitoring through a combination of lidar and radon measurements” by A. D. Griffiths et al.

Anonymous Referee #1

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Griffiths et al describe an idea to monitor mixing height from near-surface radon concentrations and lidar observations. The idea to use radon concentrations for mixing height determination is not new and the authors give proper credit to this. The new aspect in the present manuscript is obviously that a lidar is used in addition to the radon measurements. But still a few questions remain open.

(1) Griffiths et al use a lidar for mixing height determination and they indicate which algorithm is used. It would be good if the authors could give the lower range of this instrument. The authors mention ceilometers in their manuscript. But they use a lidar, because the signal-to-noise ratio is better (p 6837, l 10). They forget to mention an important aspect which made ceilometer measurements so popular in recent times:

ceilometers have a very low lower range and thus can easily follow shallow nocturnal inversions as well (at least those ceilometers which have one optical axis only).

(2) Maybe, the point mentioned before becomes more clear if the figure legend for Fig. 5 becomes more extended. What is the meaning of the shaded area in Fig. 5? What is the difference in definition of "best-match" points and "candidate" points in Fig. 5? What are the data sources for the lines and different kinds of points in Fig. 5?

(3) When reading the manuscript the reader learns that a box model is involved in the evaluation procedure (p 6842, l 9-10). It might be advisable to mention this fact a bit earlier and more prominent. The reviewer gets the impression that actually three input sources are needed: the lidar measurements, the radon data and the box model results.

(4) As mentioned before the authors made proper credit to the classical paper of Fontan et al. But maybe a few more recent papers might be helpful as well. The authors may have a look at, e.g., Emeis (2008) and Forster et al. (2012). Here, methane and hydrogen concentrations have been brought into relation with mixing height.

References

Emeis, S., 2008: Examples for the determination of turbulent (sub-synoptic) fluxes with inverse methods. *Meteorol. Z.*, 17, 3-11. DOI: 10.1127/0941-2948/2008/0265

Forster, G.L., W.T. Sturges, Z.L. Fleming, B.J. Bandy, S. Emeis, 2012: A year of H₂ measurements at Weybourne Atmospheric Observatory, UK. *Tellus B*, 64, 17771. DOI: 10.3402/tellusb.v64i0.17771

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