REVIEWER Comment to the manuscript:

"The limitations of the proposed technique (eBC-MH) should be better described in the paper. Just please summarize in the manuscript your response to my comment "Comments to Table 5, Figure 5 and related text".

Thank you for the comment and suggestion. We summarised our response to the comment in added sub-section 3.3.1 (Limitations of the mixing height determination) under Results. The text in blue presents the new text in the manuscript.

Changes in the manuscript:

Line 532–587:"

3.3.1 Limitations of the mixing height determination

Validation of the MH method is important due to robustness of the pseudo-vertical mobile measurements. We performed measurements along the circular fixed route, and therefore, passing different microenvironments of the hollow, we have reduced the direct effects of local emission sources. With measurements along the other unpopulated north-facing slopes of the hollow, we would not obtain the relevant vertical profile. This side of the hollow is covered with forest, has different terrain configuration and, moreover, would not provide sufficient answers in relation to the focus of our study (local air quality).

As mentioned in Sect. 2.3.2, the eBC-derived MH was compared to the θ-MH during temperature inversions in December (Fig. S14). The difference between group means is statistically significant, by about 0.3 of standard deviations lower eBC-MH compared to θ-MH. Population value of a slope between the θ-MH and eBC-MH, is likely to fall between 0.52 and 0.92 (95 % confidence interval). The relatively wide interval suggests a high degree of uncertainty of our method. Yet, we cannot conclude that an effect is important because the p-value, from which we determine significance, is affected by a small sample size (22 runs with both mobile temperature and eBC measurements). From frequency distribution of the θ-MH and eBC-MH data shown in the subplots of Fig. S14 in the Supplement it is evident that there is a peak in the number of runs with θ-MH of 60 m, while for the eBC-MH, most of the runs have MH of 40 and 70 m. The former eBC-MH represents predominantly early evening runs and the latter morning runs.

The difference between the θ-MH and particle/eBC-MH over complex terrain was observed in some other studies as well (e. g. Ferrero et al., 2010; De Wekker et al., 2012; Lang et al., 2015). Furthermore, Seibert et al. (2000) states that there is a lower agreement between the two methods for very low MH. The correlation coefficient of this study agrees well with the profile with timing and resolution comparability issues reported in Ferrero et al. (2011). Besides, root mean squared error (RMSE) indicates that our model misses actual MH values by less than 12 m (RMSE = 11.4 m). Mean absolute percentage error (MAPE) of the linear model's predictions are, on average 12.3 % off from actual value. Moreover, there are more negative errors than positive, indicating a systemic underestimation of the eBC-MH.

Comparing the results shown in the Supplement Fig. S14 it is important to consider that time resolution of potential temperature measurements was lower (2 min) than the resolution of particle measurements (10 s), which leads to the reduced accuracy of the θ-MH. Namely, in 2 min time, approx. 12.5 m distance and minimum 2 and maximum 20 m relative height had been walked from Hrib up to Tabor hill (13.5 m on average), indicating that an θ-MH error could be as high as 20 m. Nonetheless, this is still within recommended resolution range for MHs lower than 250 m (Seibert et al., 2000). The comparability between the two methods is lower during weak inversions and during MHs with stratified PBL structure (mainly early evening runs). This coincides with findings of studies described in Seibert et al. (2000), Gregorič et al. (2020) and Ferrero et al. (2012). An important contribution to the uncertainty of the method arises from the route specific measurements. Activity of emission sources along the fixed route, mainly residential wood burning (RWC) and also morning traffic, have an impact on the obtained vertical eBC profile and thus, on the determined MHs. In addition, the influence of land use and cover, the terrain configuration with related slope winds have a stronger impact as opposed to the standard" vertical measurement method. All of these factors are interconnected and thus, their separate contribution in the frame of this study is not possible. For safe interpretation additional measurements would be needed, i.e. traffic counts, wind measurements and/or pseudo-vertical measurements along the other slopes of the hollow.

With the following steps we tried to address some of the listed challenges arising from vertical mobile measurements along the slopes. Firstly, single events (e. g. construction work, chimney plume or passing a heavy-duty vehicle) were minimized by averaging 1-s raw data of AE51s to 10-s medians. The vertical eBC profiles presented in the study are an average of many measurements rounded to the nearest 5 m relative height. Hence, the effect of the AE51s measurement noise on the reported mass concentrations is further reduced. The effect of data aggregation is demonstrated by the standard deviation of the vertical eBC mass concentrations in Fig. S13. It is evident that measurements in areas with a higher concentration level have a higher variability than in the lower levels. Moreover, the special single events, which could have biased the results, were noted in the mobile measurements log-book and taken into consideration. Secondly, the obtained vertical profile of the hollow is a result of data points of different parts along the hollow. There is an overlap between different line segments and thus, up to 60 m relative heights, the profile is not route part specific (see Fig. S11 for the route parts height ranges). However, from there to the top of the hill at 115 m height, there is only one line segment (part of H and TR). With crossing the latter at least twice per every run (up and down the hill and after completion of some runs once more) we averaged out the single events and obtained representative distribution of eBC concentrations for the south east side of the studied area. Yet, we cannot claim that the results are valid for the other unpopulated south side of the hollow. Finally, for the MH determination, we have used data from the fixed stations as well (see Fig. S13). Besides θ, we considered RH measured at the three stations (Retje village station, meteorological station Hrib and Tabor background station). A significant reduction in RH among those stations was used as a sign for the height of a mixing layer. Additional control parameter, whether the MH is below or above the Tabor hill, was a comparison between eBC mass concentrations at the Retje village station and at the rural background station on Tabor hill. As shown also in the study of Gregorič et al. (2020), higher concentrations in terrain depression than on the top of hill indicate MH below the altitude of the hill site."