Response to Referee number 2

8th December 2020

The authors would like to thank Referee no. 2 very much for his/her expertise and valuable comments to further improve and clarify the MS. We have considered all recommendations and made the appropriate alterations. We also accomplished some other smaller corrections. Our specific responses are as follows, while the textual modifications amended can be followed in the marked-up version of the MS, which is attached.

1. Line 261-269: in this paragraph, the authors stated that the concentration of chemical species was based on the reanalyzed results of seven state-of-the-art European models. Please provide more descriptions about these models. If the reanalyzed data are publicly accessible, please provide a statement on how the data can be accessed.

Further details of the CAMS modelling method utilized were summarized and provided with a reference for the on-line availability of the model.

2. In section 3.1, the alterations in the T, RH, AH, WS, GRad and PBLHmax in the average reference year and year 2020 during the COVID-19 pandemic are quantified separately. How about the changes of wind direction? Previous studies indicated that a structure of convergence and divergence from the surface to the middle level of the troposphere also plays an important role in air pollution, so how about the convergence and divergence in the vertical direction over Budapest during the COVID-19 pandemic? The following paper is recommended for the discussion: Wu, J., Bei, N., Hu, B., Liu, S., Zhou, M., Wang, Q., Li, X., Liu, L., Feng, T., Liu, Z., Wang, Y., Cao, J., Tie, X., Wang, J., Molina, L. T., and Li, G.: Aerosol–radiation feedback deteriorates the wintertime haze in the North China Plain, Atmos. Chem. Phys., 19, 8703–8719, https://doi.org/10.5194/acp-19-8703-2019, 2019.

We demonstrated earlier that the local wind direction (WD) at the BpART Laboratory is strongly modified by the built urban environment and local orography with respect to the synoptic wind (Salma et al.: Measurement, growth types and shrinkage of newly formed aerosol particles at an urban research platform, Atmos. Chem. Phys., 16, 7837–7851, 2016, Sect. 3.2 and Fig. 5). This is the reason why we did not investigate directly the variations in WD. The long-range transport of air masses was, however, involved in the study through the macrocirculation patterns determined specifically for the geographical area. As far as the convergence and divergence in the vertical direction (as we understand, in the change of the vertical wind velocity) over Budapest is concerned, it does not seem to be substantially influence the air quality in the city

because of limitations constrained by the actual geographical location. We are aware that the vertical wind distribution could be connected e.g. to the heat island intensity, which is implicitly contained in the PBLH, and this latter quantity was indeed involved in the evaluations. The feedback mechanism discussed in the mentioned article is not relevant for us because 1) it occurs outside the COVID-19 time interval, and 2) the poor air quality in Budapest is usually associated with long-term cold air pool above the Carpathian Basin in winter, but it is accompanied by foggy situations and low radiation instead of wintertime haze, which is typical for the North China Plain. We would like to thank you very much for this comment because it triggered us to add a new section 3.8 Potentials as a follow up of this remark, where we could explain in more detail all this and the role of the *T* inversions for air quality issues in the Carpathian Basin in wintertime.

3. In Table S2, the median of hourly mean GRad in 2020 is less than that in the average reference year, and the lower radiation could suppress the development of the PBL, but the PBLHmax in 2020 is higher than that in the average reference year. Please provide explanation for this phenomenon.

The median GRad data (for ≥50 W m^{-2}) was lower in Y2020 by ca. 2.5 % than in Y3Ref, while the median $PBLH_{max}$ value was larger in Y2020 by 10 % than in Y3Ref. We think that the two differences are insignificant when comparing them to the uncertainty intervals (in particular, for the modelled $PBLH_{max}$) and when considering the effects of some other confounding meteorological variables such as precipitation. We would not draw any conclusion on the relationships of GRad and $PBLH_{max}$ based on such small differences. A short sentence dealing with this was added to the text to avoid any misunderstanding.

4. Line 277-280: Please provide quantitative results or references to explain why Spring 2020 is the third driest season since 1901.

The extremely dry spring in 2020 can likely be related to multifactorial meteorological reasons. Between 14 March and 24 April, anti-cyclonic weather types prevailed in the Carpathian Basin almost continuously for 41 days (Table S2). After this interval, the weather type was mostly cyclonic but with northerly wind, which brings dry and could air masses into the Budapest area. These factors together resulted in the drought experienced. This was also briefly added to the MS.

5. Figure 8 and 9: In the figure caption, please clarify whether the data used are observations or simulations.

The captions of the figures were extended to include the requested information.

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