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Referee Comment on acp-2021-372

Anonymous Referee #3

Referee comment on "The role of emission reductions and the meteorological situation for air quality improvements during the COVID-19 lockdown period in central Europe" by Volker Matthias et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-372-RC1, 2021

This manuscript aims to assess the roles of emission reduction due to Covid-19 lockdown and meteorology in air quality during January-June 2020 in Central Europe. It first developed detailed emission inventories for this period based on the previous year's emission data and various activity data during the lockdown, and then examined meteorological conditions during the first half of 2020 in Central Europe and compared air quality data collected from 6 sites in the above period with those from previous years. Then a chemical transport model was used to simulate the air quality in 2020 and sensitivity runs were conducted to assess the impact of emission reductions during the lockdown and the effect of meteorology change to year 2016 and 2018. The key findings include a large reduction in NO2 concentration due to city lockdown, increase or decrease in O3, and smaller reduction in PM2.5 concentrations. It also demonstrated the importance meteorology in modulating the air quality.

The manuscript adds useful information to the large body of literatures on air quality during Covid-19 lockdown and the complex interplay of emission, meteorology and atmospheric chemistry. The methods are reasonable, though not particularly new. My main comment is that there are few discussions to convey new insights/findings of this study in comparison with numerous studies by other investigators on the issue. As shown in the introduction, there have been quite a lot of studies on the response of air quality in Europe (also see two more recent papers), what is new in the methodology adopted in the present work? And what are new findings of the analysis? I am impressed by the careful development of the emission inventories for Central Europe for January-June 2020, how does it compare to another recent inventory (Doumbia et al. 2021)?

Another comment is about the organization of this paper. It is currently very lengthy, and I think it can be shortened to highlight the novel parts of this study. I also suggest moving the model validation part presented in a later part to the earlier part before showing the model results. The discussion section (Section 6) is a really part of the general results, with no in-depth discussion such as a comparison with other researchers' work and

significance/implications of the results, which should be included. The conclusion section is rather a summary of the results and is also unnecessarily long. It should be condensed and highlight the key findings.

References

- Doumbia, C. Granier, N. Elguindi, I. Bouarar, S. Darras, G. Brasseur, B. Gaubert, Y. Liu, X. Shi, T. Stavrakou, S. Tilmes, F. Lacey, A. Deroubaix, T. Wang, Changes in global air pollutant emissions during the COVID-19 pandemic: a dataset for atmospheric chemistry modelling Earth Syst. Sci. Data Discuss. (2021)

Adrien Deroubaix, Guy Brasseur, Benjamin Gaubert, Inga Labuhn, Laurent Menut, Guillaume Siour, Paolo Tuccella, Response of surface ozone concentration to emission reduction and meteorology during the COVID-19 lockdown in Europe, Meteorological Applications, 2021, https://doi.org/10.1002/met.1990.

Gaubert, B., Bouarar, I., Doumbia, T., Liu, Y., Stavrakou, T., Deroubaix, A., Darras, S., Elguindi, N., Granier, C., Lacey, F., Müller, J.-F., Shi, X., Tilmes, S., Wang, T., Brasseur, G.P., 2021. Global changes in secondary atmospheric pollutants during the 2020 COVID-19 pandemic. J. Geophys. Res.-Atmos. 126, e2020JD034213.