

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2022-60

Anonymous Referee #2

Referee comment on "Transport of substantial stratospheric ozone to the surface by a dying typhoon and shallow convection" by Zhixiong Chen et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-60-RC2>, 2022

General comment:

This is an interesting case study of significant stratospheric ozone transport down to the Earth's surface by a dying typhoon, affecting local and regional air quality. Several observational data and modeling tools are applied to analyse/confirm the downward transport of ozone with stratospheric origin. Overall, this is a well-designed study which is relatively easy to follow. Such events of direct ozone transport have implications for air quality, contributing in ozone standards exceedances. The paper fits well within the scope of ACP and I recommend publication after the following comments are addressed.

Comments:

The only thing I found missing in the analysis are humidity measurements near the surface from ground-based meteorological stations. This would offer the temporal variability of humidity near the surface, likely supporting the case that the observed ozone increases are of stratospheric origin. Is this feasible?

L41-42: A more scientific definition of the tropopause is rather necessary here.

L59: Some additional references of direct SI impact on surface ozone concentrations are needed here like Akritidis et al. (2010), Dreessen (2017), and Knowland et al. (2017).

L60: Meul et al. (2018) and Akritidis et al. (2019) also suggested an increase of STT in a future climate.

L74-76: Maybe some references are needed here. Which are the fundamental problems requiring in-depth investigation?

L78-79: "the stratospheric ozone-rich airmass was transported downward to the surface". This is Introduction and such statements are not yet supported. I suggest removing or rephrase.

L137-138: "along with ground-based automatic weather station observations": Which exactly? Do you mean the radar data? If not, are these shown anywhere in the paper?

L298: Why is the PV = 2.5 pvu isosurface selected for tropopause representations? Usually, 2 and 1.5 pvu are used. A reference/rationale for that selection would be helpful.

Figure 4: Vertical lines delimiting the O3 increase and CO decrease (similar to Figure 3) would be helpful here.

Figure 7: Here the 10-day average "between the surface and 700 hPa" is used as baseline for the O3 profiles. What is the rationale behind this selection (between the surface and 700 hPa)? As O3 increases in general with height, I think it is likely that the positive (red) departures in the troposphere are partially normal, masking the STT effect.

L407-408: "when the stratospheric airmass had reached the surface". Where does this arise from? If it's based on a Figure, please include it in parentheses e.g. (see Fig. 2).

Figure 11: What do the magenta contour line labels describe? Is this percentage (%) of total number release? Please include this information in the respective caption.

Technical comments

L16: "on 31 July 1 to 6:00" delete "1"

L25: Please move FLEXPART and WRF full names in the previous line where are referred.

L34: and the troposphere

L34: atmospheric composition

L56: STT usually stands for Stratosphere-to-Troposphere Transport which is not the case here. Please remove STT or change the phrase.

L76: origin

L80: Compare with -> Compared to

L87: Since here you are referring to a specific study I suggest to directly mention it. "Chen et al. (2021) evaluating the impacts of typhoons on tropospheric ozone showed..".

L134: and they show -> showing

L151: the stratospheric dryness -> dry stratospheric air

L199: Please include nighttime definition (hour range).

L228: "confirms" is somehow strong here, I suggest "supports the case"

L357: lasting->lasted

L458: "occurring at nigh". As this is the beginning of the conclusions, the date of occurrence should be also stated.

L459-460: "while the impacts of stratospheric intrusions on surface ozone are relatively less studied". This is somehow not connected to the previous part of the sentence, thus, I suggest to split in two sentences.

L512-513: "which underscores the necessity of considering these processes into the global model of atmospheric chemistry." This phrase is somehow strange. What do you mean by global model of atmospheric chemistry? Please rephrase.

References

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Dreessen, J. (2019). A Sea Level Stratospheric Ozone Intrusion Event Induced within a Thunderstorm Gust Front, *Bulletin of the American Meteorological Society*, 100(7), 1259-1275.

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