

Interactive comment on “Estimating ground-level CO concentrations across China based on national monitoring network and MOPITT: Potentially overlooked CO hotspots in the Tibetan Plateau” by Dongren Liu et al.

Anonymous Referee #2

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It is important to understand the recent trends of ground-level CO concentrations over China for the accurate prediction of air quality. In this study, ground-based and satellite measurements of CO and a state-of-the-art modeling tool have been used to understand the recent trends of CO. I think this study has a high potential of becoming a reference for broad scientific community and for policy makers. However, I was somewhat overwhelmed by the amount of information presented throughout the manuscript with too little explanation. I think there is still room for improvement and below are the suggestions for the authors may want to take into consideration.

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General Comments

- More background and historical context will be helpful in introduction. What is overall CO trend in China? How were the ground-level CO concentrations measured and used over China in the past? Is the data available in public? What are the short-comings of the in-situ measurements, satellite measurements and modeling studies? The goal of this study needs to be emphasized in introduction more clearly. Proper citations are needed for all the background information, specifically over China. Have there been similar studies like this?

- Why was the 2013-2016 period chosen? Is this period long enough to provide us reliable trend analysis? Wasn't the air pollution over China more severe before 2013?

- Since this study is focused on a smaller region, the importance of higher spatial and temporal resolution measurements and also higher resolution model should be mentioned as well. Considering MOPITT's large footprint (22x22 km²), is MOPITT the best fit for this type of study?

- I think there are many nice figures and tables included in the manuscript and supplement material. I would recommend reorganizing the figures with consistency. I find myself going back and forth the manuscript and supplement material trying to find the figures. I would also recommend to spend more time on describing figures and tables. Each figure contains more information than just being cited in the parenthesis.

- The results are presented here in the form of numbers and tables, which might give a quantitative information. However, it is somewhat challenging to see what the scientific messages are. I would recommend including tables only when is absolutely necessary. Figures are easier to understand otherwise.

- Section 3.3 and 3.4 contain mainly technical information and the figure numbers do not seem to have any particular order. Rewriting those sections with more explanation will help.

Specific Comments

P2, L12 – It is not clear the meaning of ‘overlooked’ here.

P2, L25 – A reference or more information needed.

P2, L27 – CTM -> CTMs

P2, L30-31 – Any references for this?

P3, L3-18 – More current references for all the satellite instruments are needed here.

P3, L10 – Deeter et al. (2014, 2017) should be included here.

P6, L18-19 – I wonder what is causing the sparse coverage over China. Also, how much coverage is considered to be enough or limiting here?

P6, L26-30 – For clarity, the authors need to include citations or data sources here. Also, how does the spatial coverage affect the bias and uncertainties?

P7, L4 – Why is the correlation coefficient higher in winter? What does the seasonal dependency in the correlation coefficients mean?

P7, L7-11 – For the MOPITT retrievals over the Tibetan Plateau, the authors might want to contact the MOPITT science team and seek for advice. Including the latest development in their retrieval methods will be useful here.

P7, L39 – Table S6 has so much information and it is not explained in the text at all.

P10, L1 – Explain what ‘importance of coal consumption’ specifically means and how is related to CO trend. Do people use less coal than before? Is combustion efficiency improving? Does this have a seasonal dependency?

P10, L6-7 – Why are the trends estimated by MOPITT lower?

P10, L10 – ‘The refined RF-STK predictions that assimilates the MOPITT-CO with ground-level CO observations provide more solid information for decision making.’ I

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think this sentence is very important and should be in introduction.

P11, L29 – ‘such as refining the prior status assigned to the overlooked hotspots in the Central Tibetan Plateau.’- I wonder how the results in this study can be utilized in improving MOPITT retrievals?

Figures and Tables

I am wondering how the figures in the manuscript and supplement material are divided. It seems like the figure descriptions in the text has no particular order.

Figure 1 – What is Heihe-Tengchong line? And what is the purpose of showing here? I do not see any relevance of inserting the South China Sea map as we are only considering the ground measurements stations here. I recommend removing the inserted map.

Table 1 – Higher correlation coefficients (> 0.9) can be marked as bold or shaded numbers for better visibility.

Table 2 can be replaced by bar-graphs, if it's possible. This applies to other tables included in supplements.

Figure S1 – How is the seasonal coverage calculated?

Figure S2 – Standard deviation (uncertainty) can be added here.

Figure S10 – What is partial dependence plot? Also, what are the x and y axes on this plot?

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-246>, 2019.

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