

Atmos. Chem. Phys. Discuss., referee comment RC1  
<https://doi.org/10.5194/acp-2021-733-RC1>, 2021  
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## Comment on acp-2021-733

Anonymous Referee #1

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Referee comment on "Contribution of Asian emissions to upper tropospheric CO over the remote Pacific" by Linda Smoydzin and Peter Hoor, Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-733-RC1>, 2021

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### General comment

This study represents a unique and comprehensive approach for attribution of pollution in the upper troposphere. However, there are aspects of the approach that could be sensitive to effects outside of the region of interest and these uncertainties should be described and quantified before I would recommend publication.

### Specific comments:

Abstract: the latitude range of the study region should be specified in the abstract.

There are several instances where a sentence is started with "Though..." Without a following clause, these are not complete sentences and are confusing in terms of meaning. Either connect these to the previous sentence or use a different starting word for example:

L22, "Though these studies..." should be "However, these studies..."

L144: "Though it can be expected..." Do you mean "Nonetheless, it can be expected..."?

L179: "Though, this region..." I think you can make this one sentence with: "...events occur, even though this region..."

L39 and throughout – I would capitalize the WCB acronym – wcb looks a bit like web and could be confusing to the reader.

L90 By using the grid cells with the highest 2% mixing ratios, you still have a seasonal dependence on the contribution of the a priori to the denominator CO amount due to differences in MOPITT sensitivity over seasons, as well as the global contributions from seasonal SH biomass burning (as you acknowledge). The contributions of these effects should be determined, including the trends in biomass burning (e.g. Andela et al., 2017) and how they affect the selection of pollution outflow events should be quantified.

L101 “number of trajectories is defined by  $\text{delLat} \times \text{delLon} \times 100$ ” What is the range and typical value for this number?

L105-106: What is the sensitivity of the results to these threshold values?

L107 “As a reference for CO emissions...” This is confusing wording – could imply that MPTRAC uses an emissions inventory, which I don’t think is the case. Maybe say explicitly: “We use the IPCC AR5/RCP8.5 emission inventory (Lamarque et al., 2010) to determine emission regions above the threshold.

L124 “extension” should be “extent”

Figure 2: Grey crosses are difficult to distinguish- maybe use these to indicate areas without statistical significance. Also, please state pressure level in the figure caption.

L173 “extraordinary high pollution” => “significant high pollution”

L175 sentence starting with “Thus we can assume..” is confusing. Please re-word

L180 “level” can be confused with vertical levels – maybe use “High CO events”

L201 “At the same time, the total number of valid MOPITT grid points...” Does this analysis consider the number of MOPITT retrievals per grid cell? This could also be indicative of sampling changes over time due to clouds.

L263 – Sec. 4.2 How do these results agree or disagree quantitatively with previous results using different approaches? A broader discussion and/or table would be useful.

L307-310: I had a hard time following this logic and implications. Does this mean these cases are not included?

Reference:

Andela, D.C. Morton, L. Giglio, Y. Chen, G.R. van der Werf, P.S. Kasibhatla, R.S. DeFries, G.J. Collatz, S. Hantson, S. Kloster, D. Bachelet, M. Forrest, G. Lasslop, F. Li, S. Mangeon, J.R. Melton, C. Yue, J.T. Randerson, **A human-driven decline in global burned area**, *Science*, 356 (6345) (2017), pp. 1356-1362, [10.1126/science.aal4108](https://doi.org/10.1126/science.aal4108)