

This version typeset on September 9, 2021

Note: We use *italics* to quote the editor’s comments.

- *Title: I would suggest to write "Microwave Limb Sounder (MLS)" instead of just "MLS" Done*
- *General comment on the manuscript. On several occasion you say the numbers are arbitrarily chosen. This needs more motivation why the given numbers have been chosen. I guess these are numbers you expect to be correct or suitable for your analyses. So that should be clearly stated and it also should be mentioned how did you derive these or how you can assume that this values could be representative. A co-author points out that the choices we have made are not really arbitrary in the dictionary sense : "capricious, random, on whim, ...". Where the word appears, I have replaced it with a more suitable one. Searching through the text, I find three places where a choice was made which we previously described as arbitrary:*
 - Reasons are given for the choices for the value of α in sec 3.1.1, so I have left this unchanged, other than removing the words “somewhat arbitrary”.
 - The decision to use a constant, plus annual and semiannual cycles to represent the CO background is described as “arbitrary”; I have changed this to “informed. We already state that we consider that other choices would give similar results.
 - P16, L264 – 265: We described the choice of the fixed size of the release box as “somewhat arbitrary”; we have removed these words. We already explain that the chosen size reflects the size of the observed pyroCb clouds.

In all these cases, we already give reasons for the choice.

- *P1, L9: that → than* “That” is actually what I meant, and “than” on its own would not make sense. I have gone for ... 5 times greater than that in ...
- *P1, L11: "these are in roughly the ratios to CO....." this sentence makes no sense, please rephrase/correct.* Sorry about that. It seemed to make sense to me and to those co-authors who read the draft in any detail. This means that it is hard for me to know what wording would be clearer. The longer explanation is that
 - Measurements have been made by various other workers of the mixing ratios of CO and various other gases in various other biomass-burning plumes.
 - We have calculated the ratio of (say) HCN mixing ratio to CO mixing ratio in those other plumes.
 - The values of $[\text{HCN}]/[\text{CO}]$ from the MLS data for the PNE are similar to the values of $[\text{HCN}]/[\text{CO}]$ from those other plumes — here I am using $[\]$ to indicate volume mixing ratio.

I thought I had encapsulated that in a single clear sentence suitable for an abstract, but clearly I had not succeeded as well as I thought I had. I have gone for an alternative which is, I think, easier to follow, but less explicit.

- *P1, L19: Full stop before reference of Williams and Abatzoglou obsolete.* Fixed.

- *P3, L28 [68 actually]: Parentheses around Fromm et al. obsolete (should be around the given year).* There were two sets of parentheses: one around the entire sentence and one around the year in the reference. As per your email reply to my question about this, I have removed the parentheses round the whole sentence.
- *P3, L69: closing parentheses obsolete.* This is the close parenthesis at the end of the sentence above, so I have removed it.
- *P8, L128: table 1 → Table 1 Fixed.*
- *P12, Table 3 caption: error → either use plural, thus "errors" or write "the error".* I chose "errors".
- *P13, L197: The relationships with CO of CH₃CN.....? What do you exactly mean? The relationships "of" CO "to/with" CH₃CN? Please check and correct.* I have made the sentence longer, but hopefully more explicit.
- *P13, L227ff: I don't like the term "launched" for trajectories. I would prefer "started".* "launch" replaced with "start" in all trajectory contexts.
- *P15, Figure 11 caption: at altitude 12 km -¿ either write "at an altitude of 12 km" or just "12 km" Fixed.*
- *P16, L264 – 265: remove parentheses around the sentence. Done.*
- *P17, L293: Add a reference?* This is the line that says " Most forest fires do not produce a pyroCb cloud. Moreover, most pyroCb clouds do not extend to a great enough altitude to loft the products high enough for MLS to observe them." I could not find a reference that spells the content of this sentence out. I have therefore added an extra few sentences referencing Peterson et al. (2017) for a typical number of pyroCbs per year (much larger than 1/17) and two sources for typical numbers of fires per year (thousands). Much of this was at the suggestion of my co-author Mike Fromm.
- *P18, L315: There is only a year given, but no author name or other source.* True. We are supposed to reference datasets these days, preferably using the DOI. I have done that, and I have used the BibTeX entry provided on the web pages to which the DOI points. That BibTeX entry simply gives the author as `author={NASA/LARC/SD/ASDC}` — it does not provide any human names.
- *P18, L320: the areas burned → the areas that burned?* Fixed here and in the relevant figure caption.
- *P19, 343: Change brackets to parentheses and move the references after "Simulations" at the end of the sentence.* Fixed.
- *P20, L363: Better to write "number" instead of "figure" (even if then appears twice in the sentence)?* Fixed.
- *P20; last sentence of the conclusion: What about the IPCC report or other climate change studies? If the extreme weather conditions will occur more frequently one also could expect forest fires to occur more frequently.* We consider that prediction

to be hard to justify because PNE-like events require conditions other than the presence of a fire. Rather than expand the conclusions (which really should not contain new material not covered earlier in the paper) I have added a few sentences to the discussion, together with a reference to Williams and Abatzoglou (2016). The last sentence of the conclusion is unchanged, but now exists to summarise the new sentences in the discussion, along with their reference. (I avoided referencing the new IPCC report as many sections of it still say “DO NOT QUOTE OR REFERENCE”.)

In other changes I have added the editor and the two reviewers to the acknowledgements. I intend to add “The article processing charges for this open-access publication were paid by the RCUK Open Access Publication Fund.” This assumes that they agree to pay the charges.