Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC1
https://doi.org/10.5194/acp-2022-252-RC1, 2022

A solid and well written paper. Congratulations.

Anonymous Referee #1

Referee comment on "Stratospheric ozone trends for 1984–2021 in the SAGE II–OSIRIS–SAGE III/ISS composite dataset" by Kristof Bognar et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-252-RC1, 2022

The paper describes a new merged ozone profile data set, based on SAGE II, SAGE III / ISS, and updated OSIRIS data. The resulting time series are analysed for ozone profile trends over the 2000 to 2021 period. The trends are largely consistent with previous findings and confirm the general understanding of ozone recovery and some climate change effects on the ozone layer. The findings also confirm the poorly understood continuing decline of ozone in parts of the extratropical lower stratosphere.

The paper presents new results, is based on solid data analysis and is well written. It fits well into the scope of Atmospheric Chemistry and Physics. I recommend publication with only very minor revisions.

My very minor textual suggestions are:

line 3: "remained ... constant ... due to changes" sounds weird. Suggest to replace "changes" by "the evolution"

line 9: "trends" might be a better word than "changes". Changes are certainly more complex than just trends.

line 13: Do you mean >80% confidence, or <80% confidence? Greater than 80% confidence would still be pretty good, and given the many sources of uncertainty might de facto not be much less confidence than greater than 95%.

line 17: Instead of "as well" I would say "even more". Dynamics play some role for ozone in the upper stratosphere, but in the lower stratosphere they are the major control.

line 18: the first "tropopause" needs to be "troposphere". The tropopause rises, but I don't think it warms.

line 23/24: There must be a better reference than Chipperfield et al. 2017 for the ODS turnaraound.

line 26: replace "ozone" by "ozone total column", and then add something like "e.g. because tropospheric ozone columns are changing due to trends in precursor emissions (TOAR, 2020)".

line 28: I think "process" would be a better word than "concept"

line 38: "reduce" instead of "limit". Also delete "likely" - we pretty much know this.

line 39: "In the lower stratosphere ..." I would start a new paragraph here.

line 45: "but" instead of "and"?

line 58: Replace "a highly unlikely realization" by "at the extreme end of". The real atmosphere is never a realization of CCM results. And reality is also not unlikely. More likely, the CCMs are missing something, or we are at an extreme end.

line 60: add "at the one percent level" after "changes"?

line 64: maybe add "chosen" before "inflection"?

line 66: I would delete the "therefore"

line 66/67: Suggest to drop the sentence "In addition .. 2019)." The same kind of thing is

true for linear trends. The middle stays the same, the end-points move.

line 68: add "high variability, e.g. due to" before "the occurence". The tropopauses are just one aspect, a lot of complex stuff is going on.

line 71: "in question" or "unclear"?

line 75: add "using only data above the" before "tropopause"? I assume that is what is done, and would be a clearer description.

line 79: "accounting for" or "considering"?

line 82: "largely reverses" or "changes"?

line 89: replace "to remove" by "which removes". I hope you are doing it right, and then the drift goes away.

line 126: add "MERRA-2" before "reference"?

line 127: "each the" -> "each"

line 129: "time and latitude" instead of "two"

line 130: delete "in the MZM". You are not talking about variability of the MZMs, you are building the MZMs.

line 146: You mention it later in the next paragraphs, but it might be good to already say it here: "The same sampling correction is applied to the SAGE III/ISS data, and the SAGE II data are also smapling corrected".

line 178: "estimate" instead of "model"?

line 186/187: "coefficients" instead of "term" and instead of "regressors"

Figure 2 caption: State the confidence level used for hatching in 2a. I assume it is 95%. I would also prefer to have hatching in Fig. 2b - that would make the comparison between the two panels much easier.

line 348: add "-OMPS" after "OSIRIS"?

line 355: trends of what? Please clarify.

line 387: Is the positive bias related to the ability? Or is it related to a downturn / lower values modelled by the DLM (compared to linear trend)? I think this should be phrased better.

line 389: I would replace "linearity" by "linear changes over time". Lots of things are still pretty linear.

line 404: "still hinders confident trend detection" It may do that forever. I'd rather say something like "masks possible trends"

line 409: "magnitude and significance" instead of just "significance"

line 411: replace "are more ... tropical upwelling" by something like "play an important role". I don't think you have shown anything about upwelling, and I am not sure you can really separate upwelling, tropopause changes, tropospheric changes, wave-driving, ... in your data.

Fig. A1: Is the correlation for data with annual cycle, or for anomalies with annual cycle subtracted. Please explain / add.

line 444: I would rename this to "SOS comparison with MLS" Among other things, we don't really know how stable MLS is.

line 453: add "QBO, ENSO and F10.7" before "regressors"

line 498: can you explain better what you mean by "inform"? I guess you take random samples of the SOS DLM trends, and samples of the SOS-MLS DLM trends, and then get a resulting "corrected" SOS trend distribution?

Overall, a solid and well written paper. Congratulations.