Review of the Paper : "The historical ozone trends simulated with the SOCOLv4 and their comparison with observations and reanalysis" (egusphere-2022-701),

by Arseniy Karagodin-Doyennel, Eugene Rozanov, Timofei Sukhodolov, Tatiana Egorova, Jan Sedlacek, William Ball+, and Thomas Peter

General comments:

The paper addresses the very interesting topic of stratospheric ozone trends and variability after 1985, split in two periods (i.e., ozone decline and recovery), with a focus on the lower stratosphere where a continuing decline of ozone in the lower tropical and mid-latitude atmosphere has been the subject of recent works. The data used in the paper are derived from Chemistry-Climate Model simulations, and a comparison of trends derived from observations composites and reanalysis data from different sources is performed.

The subject is appropriate to the Journal and contains significant original material.

The paper is generally well organized, but there are parts that need to be revisited for sake of clarity of meaning.

I recommend publication after minor revisions.

Specific comments below:

1. **Section 3 (description of the DLM approach)**

This section, especially in the last paragraph (line 182 and below should be revisited to clarify the meaning. It would be better if you split this paragraph in two parts (from sentence beginning with "It is important to note…") so that you may explain better how the trends were calculated ("..calculated from the DLM output. ..").

Was the same approach followed for the reanalysis datasets? How was it done?

Please write a line also to comment on the assessment of significance.

In the same paragraph, lines 181-182, please explain the "within 0.20-0.25". Are the correlation coefficients always positive for all variables? Or you mean something different?

2. **Section 4. 2 (Partial and total column ozone evolutions for the 1985-2018 period)**

This section should be re-written for a clearer meaning allover.

You start in line 222 with tropospheric ozone, which is then dropped (and revisited later for the observations), and in the same line (223), immediately after the end of the sentence you note changes in mesospheric ozone.

Please reorganize the paragraphs, so that you facilitate reading and clarify your findings, especially the comparison to reanalysis. It is in this section you need to justify the statement in **Section 5** (line 313 -) "...We also show that the MERRA-2 and ERA-5 reanalyses are less suitable for ozone trend analysis because..."

The same comment for reorganization of paragraphs applies to all remaining sections, as it might even be confusing at some points.

3. The statement in the last lines of **Section 5** (line 350 -)

"The results further confirm the poorly understood ongoing decline of ozone in parts of the extratropical lower stratosphere…"

What do the results confirm? That there is a continuous ozone decline in the extratropical lower stratosphere (statistically significant), the origins of which are poorly understood, or that there are indications of an ozone decline, with a patchy response, with origins that are not understood?

So please rephrase to clearly present your findings and their importance.

Technical and other comments

Abstract

Line 9: "…derived from observations and reanalyses." Please refer here to the datasets, e.e. "namely the BASIC composite of ozone, and…"

Line 14 "…do not agree with some observation composite analysis." Which ones? Specify

Introduction

Line 30 "… no or a …" change to "none or a …"

Line 69 "…BDC…" please give the name in full before using acronym for the first time, the reference to Butchart et al could be given here as well.

Section 3. The description of the DLM approach

Line 168 "…are used to represent trends…" what is the meaning of these last words? Please clarify.

Line 184 "…output DLM output." Please delete the first word

Section 4.2

For clarity, in line 219 please write "and total column ozone (represented in Figure 3 by the entire model atmosphere, upper right panel)…" or something similar.

Line 236-237 "… might be due to …" --> "… might be due to either…or…"

Section 4.3.

Line 256 "In this study we applied … and afterwards ozone changes..." please change to "In this study, we first applied… and then computed ozone changes…"

Line 261 "However…" Why "however"??

The same for lines 299 -300, you use "However…" twice

Section 5

Line 308 "…various reanalyses." -> "… a number of available reanalyses."

Line 318 "…the model provides…" -> "the model shows"?

Line 351 "…and show that also an ensemble approach…" could be better as "… moreover show that even an ensemble approach…"