Second review of

"Beyond self-healing: Stabilizing and destabilizing photochemical adjustment of the ozone layer "

by A. Match et al.

General

I see that the second version of the paper has seen a lot of work by the authors. I like in particular the change in the discussion in the paper throughout from the classical Chapman model to the Chapman+2 model. However, rereading the paper, I still feel that there are changes to the paper that did improve the readability and accuracy of the manuscript.

Therefore, I suggest that the authors consider the comments below and try to improve the paper further. I consider these changes 'minor'. If considered necessary, I would read the revised version of the paper again, but this should be the decision of the editor.

Comments

Range of applicability

I still think the paper could be clearer to where the ideas put forward here could be applied. For example, looking at Fig. 4 (and reading the caption) the proposed concept looks like a global (albeit 1D) result. However, in l. 176 it is stated that the calculation (and thus Fig. 4) is for tropical ozone. Furthermore, in the caption of Fig. 4 (and elsewhere in the paper) the 40 km demarcation is mentioned. From the explanation (which starts on page 8) I understand that 40 km is valid for the tropics (l. 176). If I am incorrect then the discussion following Fig. 4 should explain why the 40 km can be considered a global value (possibly one could repeat the calculation shown in Fig. 4 for a mid-latitude ozone profile). If on the other hand 40 km is more a tropical value, this should be clear throughout the paper (in particular in the conclusions).

Equations 4 and 5

I suggest formulating the assumptions used for deriving equations 4 and 5 more clearly. You assume

$$\frac{dO}{dt} = \frac{dO_3}{dt} = 0 \tag{1}$$

i.e., steady state between O and O_3 (I would not call this "typical equilibria"). Then you use reactions (R1) to (R6) to derive algebraic equations and then you replace the O_2 concentration by a constant value. Correct? Assuming constant O_2 concentration in (R1) would not give the desired result, would it?

Model description and documentation

I said in my first review: "..., MOBIDIC and the Cariolle scheme have certainly evolved over time during the decades since the cited reference in 1985. It would be good to have at least some information on the new parameters of the Cariolle scheme ...".

I appreciate the statement by the authors that the communication of the parameters of the scheme are a private communication and that this is a reason for not publishing these parameters. However, I suggest that the authors obtain the permission from D. Cariolle to make the parameters available to the public (in an appendix or in a table). I believe this would be of advantage to everybody considering to use the Cariolle scheme (and it would also be good for the paper).

Some minor issues

- l. 7: "that" $\longrightarrow$ "the enhanced"
- l. 13: "if" $\longrightarrow$ "when"
- l. 14: "where" $\longrightarrow$ "when"
- l. 20: "continual" $\longrightarrow$ "continuous"; but perhaps this is not the best way of describing the balance by P and L in the ozone layer
- 23: "reduce ozone at a particular altitude"
- l. 24: replace "locations" by "altitudes"?

- l. 24: do you also want to include Hartmann (1978) in this list of references?
- l. 26: you mention ODSs here, while Fig. 1 says CFCs. Perhaps make clear in the text that the same thing is meant.
- l. 37: "because" $\longrightarrow$ "from"
- l. 37: "allows" $\longrightarrow$ "allowing"
- l. 193: The top of the atmosphere (considered here) is 60 km – this is how I read these lines. Could you explicitly state this? And the numbering is from the top downwards – so the top of the atmosphere is z_0. Is this correct? I think the paper could be a bit clearer here.
- l. 193: Do you mean "z_i, where $i = 0, 1 - \mathrm{N}$"? Or "$i = 1, \mathrm{N}$"? Suggest to be accurate here. Also why not state what N is?
- l. 194: It would be good to give the value of the thickness employed here.
- l. 268: What is meant with "foundational" here? Drop this word here?
- l. 270: "rich theories" is not really clear here
- l. 285: "This assumption" is "$C_{\mathrm{O}_2} = 0.21$" – correct?. But I think the central assumption is the equilibrium between O and O_3 (see also above).
- Eq. 17: try "`\left(`" and "`\right)`" instead of the brackets in the LaTeX equation.
- l. 583: lower than what?