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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A revised linear ozone photochemistry parameterization for use in transport and general circulation models: multi-annual simulations" *by* D. Cariolle and H. Teyssèdre

Anonymous Referee #2

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This study of Cariolle and Teyssedre revises the Cariolle and Deque (1986) - CD86 successful (and well used) linear ozone parameterisation by updating the relevant coefficients and adding a heterogeneous loss for polar ozone. The current work is thorough and convincing and generally well presented and the new scheme will contribute to ozone and climate studies. The paper therefore deserves publication if the following comments and suggestions are satisfied.

Major Comments

1. By definition the new relaxation coefficients derived from the 2D model using the updated chemical kinetics should lead to a better estimate of the ozone distribution. But in order to confirm the improvement it would be good to see some kind of comparison with ozone output from the old CD86 scheme.

2. The validation against the observations of the total ozone temporal and latitudinal evolution in figure 6 raises some questions about the ability of the CTM (MOCAGE) and the forcing analyses (ECMWF operational) used to generate the ozone output with the ozone scheme. There is clearly a problem of overestimation of the extra-tropical total ozone (of the order of 100 DU in the Arctic) and it seems that the tools used for the validation are not ideal. For the more complete validation it would be good to see some evidence of the ozone scheme used with a different CTM or forcing analyses (UKMO?). The comparison in figure 6 is much better in the Antarctic so a more thorough discussion of these inter-hemispheric differences is needed(and their causes).

Minor comments

1. The authors must emphasize the implementation of the CD86 scheme by others and give more credit to work that has successfully exploited the CD86 scheme. This will strengthen their point of the usefulness of their revised ozone parameterisation. For example, in the second paragraph of the Introduction, the following studies, which have made extensive use of the CD86 scheme highlighting the dynamical aspect of long-term ozone changes, could be mentioned:

a. ozone trend CTM studies (Hadjinicolaou et al. 2002, Hadjinicolaou and Pyle 2004, Hadjinicolaou et al. 2005, Jrrar et al. 2006) and b. ozone-climate GCM studies (Braesicke and Pyle 2003, Braesicke et al. 2003, Pyle et al. 2005, Braesicke et al. 2006).

3. p. 1662, l. 23: In Hadjinicolaou and Pyle (2004) is is mentioned that the temperature threshold of the PSC formation in their version of the CD86 scheme is pressure

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dependent, somehow accounting for the different humidity and pressure conditions in the lower stratosphere, does your scheme deals with this?

3. p. 1663, l. 25: any reference for the observed evolution of the ozone profile?

4. p. 1664, l. 3 and l. 11: where do you show the TOMS data?

5. p. 1664, l. 24: probably you don't apply the cold tracer in the lower latitudes where similar cold condition can occur in the tropopause, how do you get around this?

6. p. 1666, l. 6: actually a more detailed description of this University of Cambridge version of the CD86 scheme is given in Hadjinicolaou and Pyle (2004).

7. p. 1666, l. 14: what does "1,2 to 2,5 weeks" mean?

8. p. 1666, l. 18: what does the "4,5" in the "(195/T)" of equation (4) mean? It's not a number of power right? Maybe a Latex error in the equation numbering? Otherwise justify.

9. p. 1675, l 8: replace "Zerephos" with "Zerefos".

10. Dobdon Units in figure 6 are impossible to read without magnifying 400% in the .pdf file, please enlarge or use less frequent step for the DU in the legend

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