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Interactive comment on "A three-dimensional model study of long-term mid-high latitude lower stratosphere ozone changes" by M. P. Chipperfield

Anonymous Referee #2

Received and published: 3 April 2003

I found this to be an interesting paper with something to teach us about lower stratospheric ozone trends and variability. Unfortunately it lacks in discussing and drawing conclusions from model runs. This could be rectified by fleshing out the text by the author. Once that and the following points are addressed I would recommend publishing this paper.

General Comments

- 1. The winds that are used to force the model may not be independent of the changes in ozone (since the heating rate due to ozone does change the winds). This may explain some of the model ozone changes in Run B and would change how that run is interpreted. Please discuss.
- 2. There is remarkably little discussion of model runs C and D in the paper but I

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think they are significant. This may be due in part to the difficulty of separating the lines in the various figures. I would suggest that there be a figure like figure 4 which shows the difference between Runs B-D and Run A.

Specific Comments

- 1. Page 1083, lines 20-25. The upper stratospheric ozone trend, caused by chlorine, should be mentioned as a cause of ozone decreased that are not included in the 3D model. While this term is much smaller it is not completely negligible.
- 2. Page 1084, lines 23-26. The fact that the 3D model forced with the meteorological analysis captures the dynamical variability on time scales of days to a few years does not mean that the variability on time scales of decades is improved. Especially since the data going into the analysis is changing. Can you estimate the error in the analysis on time scales of decade and its affect on the conclusion of the 3D model.
- 3. Page 1088, lines 2-4. The aerosol data beyond 1995 is available. The calculations should be updated using it.
- 4. Section 3.2 There is no mention of the passive and chemical tracer lines shown on Fig. 2 in the text. Please discuss them or remove from the figure.
- 5. It is interesting that the dip in the ozone around 1985 in the SH in the model runs shown in Fig. 3 seems to be largely missing in Fig. 4. Why is this?
- 6. I think that the scale on Fig. 3c,d should be expanded since the model lines are too difficult to separate.
- 7. Page 1091, lines 15-17. I cannot see this by eye.
- 8. Page 1092, lines 3-6. The minima in 1995 is not modeled at either site.

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- 9. Section 3.6 The profile changes appear to me to very dependent on the specific pairs of years chosen. I conclude this by looking at Fig. 3c,d which shows that one could get just about any response depending on the pairs of years if the profile changes roughly follow the column changes. Is this so?
- 10. Page 1094, lines 21-23. I do not understand your point (ii) and how it relates to the differences between the two papers. Please further discuss the reasons for the differences between Hadjinicolaou et al. (2202) and this paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 1081, 2003.

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