

Interactive comment on “2002–2003 Arctic ozone loss deduced from POAM III satellite observations and the SLIMCAT chemical transport model” by C. S. Singleton et al.

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This work is a comprehensive description of Arctic ozone loss in winter 2002/2003 as derived from a combination of POAM III measurements of ozone with passive ozone fields calculated by the SLIMCAT CTM. The approach used in the paper and the model are both well documented in the literature. The analysis is solid and the results are interesting. The comprehensive description of the ozone loss results alone make this paper a valuable contribution and would justify publication in ACP. But the paper goes beyond a simple description of the derived ozone losses. Particularly compelling parts

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of the paper are:

- A thorough discussion of how the downward propagation of initialization errors can impact the results. This has been less clear in previous publications that used the same approach.

- The use of a "pseudo passive" ozone tracer, which allows the quantification of the fraction of ozone loss that is due to normal gas phase chemistry. The results from this section are new and exciting and add considerably to the overall value of the paper.

- A thorough comparison of the empirically derived loss with ozone loss calculated by the new version of SLIMCAT. This section impressively demonstrates the ability of the new SLIMCAT to reproduce the magnitude, timing, and vertical structure of the ozone loss in 2002/2003. It will be extremely interesting to see whether these results also hold for other winters.

The paper is well written and easy to follow. The figures are all clear and appropriate. I recommend the publication of the paper in ACP without much changes. I have just the following minor comments:

page 7016, line 21: One should perhaps mention that the correct representation of transport in the model does not only require correct wind fields, but also mean that numerical diffusion in the model has to be small. In principle, and depending on model resolution and advection scheme, numerical diffusion can have a significant impact on the passive ozone field in the model and hence on the ozone loss derived by the CTM-PS method.

page 7018, line 8: POAM Version 4.0 is now available and is somewhat different from version 3.0. I do not think that this will have a significant impact on the results described here, but I think a sentence or two are needed that say how the results would change if version 4.0 had been used (probably not much change, but this would still be important information).

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page 7022, line 28: the net production mentioned here probably occurred at lower latitudes and was then advected to the POAM sampling latitude. To avoid misunderstandings it might be useful to mention this here.

page 7023, last line: Do you have any idea why ? Is this due to problems with the NO_x chemistry in the model ? I am just curious - a discussion of this effect would probably be beyond the focuss of this paper ...

page 7026, line 18: Since the explanation given further down is so convincing, one could say here: "A likely explanation is horizontal transport or mixing accross the vortex edge, that is not included in the vortex average approach ..."

Figure 1, caption: It should be mentioned that T means the *minimum* temperature inside the polar vortex.

Figure 2: The figure would be easier to read if the dates were given in simpler format, e.g. 21 Jan 2003 or similar.

Figure 3: Typo in the "Equivalent". Also it should be in brackets, because for some points the label should read just "latitude".

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 7011, 2004.

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