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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ozone loss and chlorine activation in the Arctic winters 1991–2003 derived with the TRAC method" *by* S. Tilmes et al.

Anonymous Referee #2

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General comments:

This paper describes the Arctic chemical ozone loss derived each winter since 1991 using the ozone Ű tracer correlation method. The results are mainly based on HALOE ozone and tracers (HCl and HF) observations. The study shows the interaction between the meteorology and the ozone loss as well as the influence of the vortex conditions (warm, cold, weak etc..). In addition, the method allows to look at the homogeneity of the ozone loss inside the vortex. The influence of the "early reference function" on the final result's uncertainties is correctly discussed. The authors report on the vortex conditions for 12 winters and summarize ozone loss using the same method (TRAC). This paper is very valuable and useful for the community.

Specific comments:

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Discussion Paper

A large part of the discussion in this paper is based on "weak" polar vortex, "strong cold vortex", "less strong and moderately warm vortex" etcĚHow do you determine the strength of the vortex? How do you determine if a vortex is or not perturbed?

Can you explain what you consider as "sufficiently long lifetimes " for tracers. Or later in the same paragraph: " very long lifetimes" What is the order of magnitude?

In the abstract it is written that: "Results estimated here are in agreement with the results obtained from other methods. However, there is no sign of very strong ozone losses as deduced from SAOZ for January considering HALOE measurements." It seems that this sentence applies for all winters. However, this is in contradiction with what is written in the paper: On page 2177 line 22 it seems that it applies to winter 1995-1996. On page 2196 line 14, it seems to apply to winter 1993-1994 and 1995-1996. On page 2178 line 25 it is clear that it does not apply to all winters as you are saying that " Thus ozone loss have already occurred during January 1992". Can you be more specific in the abstract and in the text.

Section 3:

Page 2177 line 26 For the winter 1996 , using one single observation of HALOE, you see strong chlorine activation (fig 1 bottom) but no O3 loss. Can't it be explained by the latitude of HALOE observation between 23-31/1/96?

Page 2181, line 10: How do you deduce from figure 4 that the strong chlorine activation "In February and at the beginning of March " occurred only in the lower stratosphere below 420K?

Section 4:

Page 2187 line 19: "The results derived using two different tracers are within the combined uncertainties for each year. To perform a comparison between the different years, the average of the maximum ozone loss of the two different long-lived tracers is calculated (Table 4, column 6). The strongest local ozone loss of all the years considered,

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about 2.4 ppmv in 1995Ű96 and 2.5 ppmv 1996Ű97, was found in the altitude range from about Ě.. " The paragraph should probably be rewritten for clarification, insisting on the years and on the altitude range at which the loss occurs.

Section 5:

Comparison with SAOZ: for the winter 1993-94 and 1994-95 the correct reference is Goutail et al. , 1999.

Page 2196 line 18: "Such values are approximately in agreement" Be more specific.

Section 6:

The discussion on the impact of the location of the area of PSCs on the ozone destruction is difficult to follow (page 2200)

Section 7:

Page 2202 line 25 "Results of the winter 1996-97 to 2002 seems to be a bit large" It seems to me that it is not true, it should be written, " Results of the winter 1996-97, 1999-00 and 2001- 02 seems to be a bit large" In addition, it is not clear in the text, that the word "results" apply to SAOZ method and not TRAC.

Minor comments:

Page 2172 Line 27: The use of different met. analyses may result in differences up to 25% Ě of what?

Page 2191, line 28: Comparison of ozone loss using CH4 or HF long-lived tracers. You are saying that CH4 mixing ratios below 450K may be problematic in these years (1996 and 2003), due to signal saturation problems. Is the signal saturation due to an instrumental problem? Is-it a systematic problem ?

Page 2214 Table 1: It is not written in the text that you are using a polynomial function of degree 4 or less than 4 and that the various coefficients are reported in table 1.

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Page 2222 table 7: There is a problem in the titles, the altitude range of each column has been shifted, : SAOZ/REPROBUS : columns; Match (370-700K); HALOE (380-550K)

Typing errors:

Page 2172 line 7: the HALOE instrument measures (instead of instruments)

Page 2172 line 24: total ozone column from global (instead of form)

Page 2173 line 14: without the presence of sunlight (instead of present)

Page 2173 line 3: from November 1991 to December 1991(instead of 1992)

Page 2175 line 8: the Canadian model is CMAM (instead of CMAN)

Page 2188 line 27: For the most years (instead of For for)

Page 2194 line 4: The early winter reference (instead of winter winter)

Page 2208 line 8: replace jgr by J. Geophys. Res.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 2167, 2004.