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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical note: A stratospheric climatology for O_3, H_2O and CH_4 derived from HALOE measurements" *by* J.-U. Grooßand J. M. Russell III

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General Comments

We thank both referees for their review and suggestions. In the revised version of the paper we will account for these suggestions.

Referee 2 asked for potentially adding the observations of NO_x to the climatology. Referee 1 suggested to point out the use of this climatology for the model validation of chemistry as well. We agree with these suggestions and we will add a NO_x to the climatology. Chemistry model validation may be also valuable for HCl and HF that are

observed by HALOE. Therefore we will also add HCl and HF to the climatology.

However, in the case of NO_x one has to note that in the upper polar stratosphere NO_x is strongly influenced by solar activity. Therefore the NO_x mixing ratios show high variability in the upper polar stratosphere. One has to consider that when interpreting the climatology. Furthermore during nighttime N_2O_5 is formed from NO_x that yields lower NO_x mixing ratios at sun rise. Therefore we use only sunset data for the NO_x climatology.

Referee 1 asked to add the monthly means for the entire period as additional electronic supplement. Although these data set does have some gaps, it will be useful for comparing the year-to-year variability. We agree and will do so in the revised version of the paper. Especially for the NO_x that is produced intermittently by solar activity it is valuable to have these data for interpretation. However, we do not expand the discussion for the added supplements to great detail to keep the paper concisely.

Both referees pointed out that the approach is very similar to the UARS reference atmosphere project (URAP). Indeed the approach in this paper is very similar. The advantages of the presented climatology in the revised version are that we do use a longer time range. Also we include NO_x in the revised version that is not part of the URAP climatology. Further, as a suggestion of referee 1, we will include also monthly means for the entire period. Therefore, we think that this study does indeed give additional valuable information in addition to URAP. To our knowledge the 7-year URAP climatology is preformed after the method of Randel et al. (1998) in which the seasonal cycles are fit using a harmonic regression analysis. If we would reduce our data to the 7 years we get comparable average mixing ratios. However, in the URAP climatology, the latitudinal gradients are smoother, most likely due to a lower latitudinal resolution. Also the 1-σ variability in the URAP data is significantly lower (O_3 about 20%, CH_4 about 30% and H2O about 40% between 500 and 1000 K potential temperature). We will leave it to the reader to smooth the data if lower latitudinal resolution is needed.

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The minor advantages of the presented climatology are, that the URAP climatologies are compiled for pressure vs latitude and potential temperature vs equivalent latitude. We show pressure vs equivalent latitude also for pressures below the 100 hPa level. URAP also does not contain data interpolated in time at the poles. Also, the special care that is taken to construct the equivalent latitudes (first calculate the synoptic 12 UT location, then determine equivalent latitude for that point) is probably not done in the URAP climatologies.

The climatology presented in the revised version is updated as the HALOE team went through the dataset and deleted few profiles in which the retrieval did fail.

Detailed answer to Referee 1

1. Referee 1 suggested to point out the use of this climatology for the validation of chemistry as well. We agree. As explained above we also add NO_x, HCl, and HF to the dataset which also serves this purpose.
   The introduction has been rewritten in order to clarify the points raised by the referee.

2. Monthly mean data of the entire period of all species will be included in the supplement

3. Comment on p. 2975, l.14ff: will be rewritten as suggested

4. Comparison with the Randel climatology: As explained above, the results would be very similar to the Randel climatology when limiting it to the period 1991 to 1997. However the latitudinal resolution is higher as explained above. We include a statement of this comparison into the revised version.

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We agree that the discussion about the HALOE data uncertainties and comparison of HALOE with other recent data sets as SAGE II (version 6.2 H_2O), MIPAS or GOME was not sufficient in the ACPD paper. We therefore add a paragraph on HALOE data uncertainties. It contains a brief discussion that reviews the existing validation papers. It is, however, beyond the scope of a technical note in ACP to do a validation exercise between HALOE and datasets for which no validation papers have yet been published (as MIPAS-ENVISAT or ILAS-II).

5. Comment on p. 2976, l.5ff: will be rewritten as suggested

6. Comparison with Randel Climatology, see point 4.

7. We agree with the argument that the recommendation to use the climatology for future predictions until 2015 is not justified and remove it from the revised paper.

8. Comment on p. 2979, l.24ff:, see point 7

9. The header of the supplements will be extended by the reference as suggested.

Detailed answer to Referee 2

1. As said above, NO_x will be added to the revised version of the paper.

2. We follow the suggestions of the referees to expand the supplement to have the whole vertical range and the variability also available as ASCII files.

3. Standard deviations will also be available as ASCII files as suggested.

4. We thank the reviewer for pointing this out. Typically there is a weak PV gradient in polar summer due to the solid body rotation. The best way to decide, whether the concept of equivalent latitude is better than using latitude is by comparing

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the variability in the climatology. We recognize indeed that the variability in polar summer is lower using latitude. For that reason we do also include a similar dataset that averages over latitude and discuss this in the revised paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 2973, 2005.