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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Classification of Northern Hemisphere stratospheric ozone and water vapor profiles by meteorological regime" *by* M. B. Follette et al.

M. B. Follette et al.

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The authors would like thank the reviewer for all of their comments and feedback. Below we have written responses to each comment. The referee's comments are italicized and our responses are in print.

The authors used total ozone gradients from TOMS to locate different meteorological regimes, divided as by synoptic fronts to tropical, midlatitude and polar regimes. They applied this division to ozone and water vapor profiles measured by HALOE and SAGE with the motivation "...to determine how well, and over what altitude ranges and seasons, stratospheric ozone and water vapor profiles can be usefully differentiated by meteorological regimes." The work is very much based on Hudson et al. (2003), here *applying the regime concept to satellite data instead of ozonesonde data, and broadening the scope to monthly climatologies of the trace gas profiles. The paper emphasizes that vertical mean profiles should be regarded in their synoptic context rather than according to their latitude. This idea is not new to the scientific community and has been approached in various ways, introducing e.g. equivalent latitude, or tropopause based coordinates. Although a difference in tropopause height between the regimes is identified as major contributor to the trace gas variability in the lower stratosphere, the paper is completely lacking any discussion of the related dynamics.*

In the current version, the aim of the paper remains vague. The text is mostly descriptive and provides few interpretation. To my opinion, some parts can be considerably shortened (see below), while the discussion of the profile climatologies has to be substantiated by discussing dynamical processes in the UTLS (e.g. isentropic transport, TTL).
In the revised manuscript, we have lengthened the introduction to include more background on the various transport regimes in the stratosphere. In addition, we have attempted to discuss our results with respect to previous work using other dynamical coordinates. We have also removed several figures in order to shorten the paper.

GENERAL COMMENTS Section 4.1: A step forward from the Hudson et al. (2003) paper can be the focus on the climatological profiles. While Figure 1 demonstrates very well the division of satellite profiles to different total ozone zones / meteorological regimes, the presentation of the single profiles in Figures 2 and 3 is redundant.
We agree, Figures 2 and 9 have been removed in the revised manuscript.

Section 4.2: Does the comparison of HALOE and SAGE climatologies (p.13387, line 6 p.13388, line 10; Figure 7) add any scientific value here? It seems like this section only highlights the difference in the instrument's sampling patterns, which should not be the goal of this paper.
The aim of this section was to show that despite the large differences in sampling, when viewed in terms of regimes, the means agree very well below 20-25 km. The

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differences in sampling are more clearly seen above this altitude, supporting the conclusion that meteorological influence does not reach above 25 km.

Section 5: Both comments above are also valid for the water vapor section, implying that the presentation of the single profiles in Figures 9 and 10 is redundant, as well as the comparison of HALOE and SAGE (Figure 13). While the whole analysis should consider a profound discussion of involved transport processes, this is even more important for the water vapor section as e.g. H2O is subject to dehydration in the TTL.
As stated above, Figure 9 has been removed from the revised manuscript, and the motivation behind the SAGE II and HALOE comparison was the same. A more involved discussion of transport processes and previous papers has been included throughout the ozone and water vapor sections in the revised manuscript.

SPECIFIC / TECHNICAL COMMENTS Abstract: Lines 10-14 and 15-18 are repetitive.
This was a clerical error on the author's part. It has been removed from the current abstract.

p. 13383: Several criteria are defined to identify the ozonepause, but can these really be vertically resolved by the satellite data?
Vertical resolution will certainly affect the calculated height of the ozonepause, but it should not significantly affect the variations as a function of season or regime. In order to test how smoothing might result in an overall bias, we smoothed ozonesonde data from Wallops Island, VA from 1996 through 2002. Ozonepause heights calculated using the high resolution ozonesonde data were compared with those calculated with the data smoothed over 2 km using a boxcar average. Over the seven year period, 396 profiles were analyzed, and the mean difference (sonde height 8211; smoothed height) was 500 m.

p. 13386, line 22: The instrument description section 2.2 claims that the HALOE altitude range sampled was from 15 to 60-∼130 km, so how reliable are the data in the 10 20 km altitude interval (below 15 km)?

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HALOE ozone profiles were found to agree with coincident ozonesonde measurements to within 10% down to 100 mb, and better than 20% down to 300 mb in the extratropics Bhatt et al. (1999). This reference is included in the revised HALOE data section.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 13375, 2008.