**Review #1 (Prof. Andrew Dessler)**

This paper describes a combined water vapor and ozone data set. This could be a widely used data set and the paper describes it well. I recommend publication after the authors consider my comments below.

My most important comment has to do with the construction of the combined anomaly data. Looking at earlier versions of SWOOSH, I remember that the different satellites had different shape seasonal cycles (at least in certain places), and this caused problems in the combined anomaly data. So I ended up doing my own merge by taking the anomaly time series for each individual satellite and merging those, which required subtracting the offset during their overlap periods. I presume this problem with the seasonal cycles is still an issue. I'm not recommending they change anything in how the data set is presently constructed, but I would suggest that the authors mention something about this as well as the fact that users of the data might want to create their own merged data set.

*We thank Prof. Dessler for the comment on this, as it is possible that SWOOSH users may wish to construct or explore alternative merging methodologies to that which we've provided as the standard SWOOSH product. We have added text in section 4.3 to address this. As we note in the text, because we provide statistics such as the means and N (the number of profiles in a bin) and the individual anomalies, users are free to construct alternative merges with the SWOOSH data set.*

page 7, line 8: The conserved quantity in HALOE is between 1.7 and 1.9 ppmv H2O/ppmv CH4, as described by Dessler and Kim [Determination of the amount of water vapor entering the stratosphere based on HALOE data, J. Geophys. Res., 104, 30,605-30,607, 1999; see Table 1]. I don't know if that'll make a difference, but the authors should use the correct value.

*We reproduced our plot using different slopes, and the values are completely insensitive to the choice of slope. We've changed the value used in the paper to be 1.8, which represents a "middle of the road" value given by Dessler and Kim.*

Also, does "discard the profile below 15 hPa" mean altitudes below 15 hPa or pressures below 15 hPa?

*It means at altitudes below 15 hPa. We've clarified this in the text.*

page 10, line 5: In the calculation of the uncertainty, do the authors take autocorrelation into account? Because of temporal autocorrelation, the number of independent pieces of information is less than the number of months, and this needs to be accounted for. See, e.g., Santer et al. (2000), (Santer et al., 2000), J. Geophys. Res., 105, 7337- 7356, doi: 10.1029/1999jd901105.

*We thank the reviewer for pointing this out. We've tested the impact of adjusting our N based on the lag-1 autocorrelation, as in the Santer et al. paper. Given that the frostpoint data are taken approximately monthly, the autocorrelations are fairly small, between ~ 0.05 and 0.15. An autocorrelation of 0.15 corresponds to a 25% reduction in the degrees of freedom and a 1/SQRT(0.75)= ~%15 inflation in the size of the error bars in our Figures 3 and 4. While this is not particularly large, we have nevertheless included an accounting for autocorrelation in the text and figures now.*

page 10, line 26: Something is wrong with this sentence; the word "seven" doesn't make sense.

*Fixed.*

An aside: the authors spend a lot of effort matching satellite measurements with other satellites and sondes. These approaches have been done for decades, and I find them pretty unconvincing. The "match" criteria is set to get a large number of matches rather than because the criteria actually designate similar air masses. While I don't doubt the answers that the authors get are right, I think they'd get pretty much the same answer if they just compared zonal average (perhaps using equivalent latitude). I'm not suggesting they change anything, just letting them know what I think.

*We agree and expect that the results would be roughly similar as a zonal average. But as we have considered a number of sounding sites across the globe, some locations are in regions of strong (equivalent) latitudinal gradients in tracer mixing ratio (particularly ozone), so including an equivalent latitude constraint on the match provides some improvement in the matching. Also, as we only consider one satellite profile for each ozone/frostpoint sounding, the eq. lat matching actually allows us an objective way to pick one profile from among the potentially large number of profiles that meet the more coarse time and geographic distance criteria.*

page 14, line 22: I know what equivalent latitude is and I still couldn't understand what the authors were trying to say. Please clean up this definition and make it understand- able. Also, is the equivalent latitude calculated independently at each altitude? (in other words, could measurements at different altitudes from a single profile have different eq. latitudes?)

*We have simplified the definition, and clarified that the equivalent latitude is calculated at each altitude of the satellite profile.*

Fig. 10: I don't see a big difference between geographic latitude and equivalent latitude in Fig. 10. The real advantage of equivalent latitude is not in the zone average, where excursions tend to cancel, but the fact that there is much lower scatter among measurements made at a particular equivalent latitude then at the same geographic

latitude. The authors might want to find a better way to demonstrate the benefits of eq. latitude.

*We've changed the figure to better illustrate the benefits of equivalent latitude, particularly with respect to identifying the low ozone concentrations associated with the Antarctic ozone hole. Changes to the figure include changes to the altitude, colorbar type, and color scale, as well as making the figure a contour plot to allow for an easier quantitative comparison. We also removed the SAGE-II data, as the SAGE-II sampling during the chosen month was at too low of a latitude to illustrate the utility of equivalent latitude.*

page 19, line 5-6: 82 hPa is not in the lowermost stratosphere.

*We've fixed the wording to say "lower" stratosphere.*