**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Evolution of stratospheric ozone and water vapour time series studied with satellite measurements" *by* A. Jones et al.
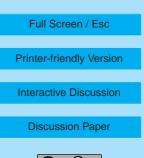
Anonymous Referee #2

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The authors have put together and impressive amount of data, and used this combined data to estimate trends in ozone and water vapor. There is a lot of interesting material here, but perhaps inevitably, incorporating so much data into one paper has led to the neglect of some important details related to individual datasets. Such points are particularly important in undertaking a trend analysis. The authors should address these points before the paper is accepted.

Major points:

Unless there is some new thinking about SAGE II water vapor data, the inclusion of this data on Figure 7 is enough to warrant rejection of this paper, since it might otherwise

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cause great confusion in the water vapor community. The authors even reference Taha et al. [2004], which states: “However, using SAGE II long-term water vapor record in trend analysis is not recommended until further assessment of the effect of channel drift corrections.” As far as I can tell (please correct me if I’m wrong) there is no author on this paper with SAGE expertise, nor is there any newer paper on SAGE II water vapor which suggests that anything has changed, nor is there any particular discussion here which suggests that the authors are even aware of this issue.

A second major criticism is based on the statement: “We then create a weighted all instrument average where each instrument residual time series is weighted depending on the total number of profiles that contribute to create each monthly average.” If this is really what the authors are doing, they are making a very poor choice of instruments to determine trends. Instruments with many profiles (e.g. SBUV) will dominate the trends. Yet the instruments which provide many profiles are very often not the best instruments for long-term trends. HALOE trends are almost certainly much more reliable.

The authors need to clarify exactly what they’re doing with respect to the seasonal variations. On the one hand it seems they have removed the seasonal cycle. Yet then they still try to fit an SAO. Why is there still an SAO left after fitting the seasonal cycle?

The short-term variation in the monthly HALOE residuals is much larger than I would have expected, both for the ozone and the water vapor, especially given a 30 degree latitude band (60 degrees for water vapor) and a 10 km averaging for the bin. 10

Minor suggestions and typos:

This is an awfully long sentence: “ As studies to date only present time series until 2005, we extend both stratospheric ozone and water vapour time series until April 2008 by using a combination of various satellite data sets, many of which have been used in previous studies, especially the historically longer and older times series such as from SAGE, HALOE, SBUV/2, and POAM III, but we also use shorter and

newer time series from Odin/SMR (2001-present), Odin/OSIRIS (2001-present), Envisat/SCIAMACHY (2002-present), and Aura/MLS (2004-present). 8220;Each satellite had a low temporal and spatial coverage8221;. I don8217;t think you can use the word 8220;low8221; in this sense. 8220;Furthermore, analysis above 45km would mean extra care would need to be taken to account for large non negligible diurnal variability in ozone and water vapour.8221; The diurnal variability of water vapor is small until well into the upper mesosphere. Figure 1 8211; There seem to be large differences in the amplitudes of the seasonal variations between different instruments, with the SBUV measurements generally showing much smaller seasonal variations. Why is this? 8220;We see a good phase fit in the tropics as there is typically no time lag since the QBO is a tropical phenomenon.8221; I8217;m not sure that I would necessarily expect the phases to line up, but since the authors bring up this point for water vapor then why don8217;t they line up for ozone? Table 1 8211; In the last 7 columns the 8220;change in trend8221; is simply the difference between the pre and post 1997 trends, but in the first 2 columns they don8217;t add up. This is a poorly written sentence: 8220;After the assumed 1997 turn around, trend values show that the reduction in ozone in the stratosphere has slowed down and in some cases has even possibly increased although the majority of trend values are not significant at the 2 sigma level.8221; 8220;liner8221; should be linear. 8220;However, by combining all data it is possible to use data sets that are much shorter as long as instrument drift (if any) is accounted for.8221; For all the nice mathematical analysis presented here, it8217;s of course the unknown instrument drift that in the end is almost certainly the limiting factor, not the formal noise in the data series.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 1157, 2009.