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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: a combined SBUV and SAGE zonal-mean ozone data set" *by* C. A. McLinden et al.

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Response to Reviewer #1 (S. Frith):

When talking about the inherent vertical resolution of the SAGE and SBUV measurements, the authors note the much higher vertical resolution in the SAGE data as compared to SBUV. In my mind I see a difference between using the SAGE data to correct the SBUV (but maintaining an SBUV-like product) and imposing the SAGE resolution on the SBUV data, thus creating a truly hybrid data product. If the SAGE data were being used solely to correct the calibration and inter-instrument differences the SAGE data should be vertically sampled using the weighting functions of the SBUV instrument, or some smoothing closer to the SBUV vertical resolution. The authors did integrate the SAGE data over the 3 km SBUV layers, but as noted, the true SBUV

resolution is lower.

The authors note that using the SAGE data in this fashion has added value to the SBUV product. However, how much do the authors trust that the added vertical information is real and not noise, given the inconsistent sampling that goes into the SAGE monthly zonal means. I'm particularly thinking about the trend plot... is the 'jaggedness' in the vertical trend a true feature that is smoothed out by SBUV or is it noise from the SAGE sampling?

One possible test would be to first smooth the SAGE data using a 6km vertical running average, then integrate in the 3km layers and plot the QBO (Fig. 1). This would be more equivalent to the SBUV plot, and would help to indicate rather the vertical consistency of the SAGE or the vertical resolution is the most important factor. That is, if the smoothed SAGE still shows a coherent, albeit smoother, QBO, this suggests it is the inconsistent SBUV data rather than it's resolution that is the problem.

– As reviewer suggested, we smoothed SAGE data down to SBUV-like vertical resolution using 5 and 7 km running means. In the smoothed SAGE data the QBO signal is evident with the same phase velocity although with a smaller (up to 2 times) amplitude as the QBO from the original data. This would suggest the vertical resolution is not the only issue. The inconsistent sampling of SAGE should not introduce much/any noise since SBUV was sampled as the location of the SAGE profiles, and it is only these pairing that are used, thereby canceling out any sampling issues to a large degree.

The authors also note the potential effect of temperature trends on the conversion of SAGE data from altitude to pressure coordinates. This point may turn out to be important, especially above 10 hPa where no NCEP reanalysis data are available. The authors need to point out that Figure 11b are percent trends calculated on altitude and Figure 11c are percent trends calculated on pressure (see WMO (2007) Figure 3-7), and also note that at least some of the difference between the trends in the two figures is due to temperature trends (WMO (2006), page 3.7). A discussion along the lines of

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what is in the WMO report to explain these differences would be helpful. Also, I do not see a reference for Randel (2009) in the references.

– The effects of temperature on the ozone trends are better understood than at the time of manuscript submission. As the reviewer suggests, it is issues with the reanalysis (above 10 hPa), that has led to the differences in trend values (Figure 11a, vs. 11b and 11c). The WMO discussion, and the Randel et al. reference, are now included as part of a revamped discussion on the interaction of temperature and ozone trends. A related paper by Rosenfield et al. (2005) is also used. Specifically, in the upper stratosphere the reanalysis contains an incorrect trend in temperature that is impacting our derived ozone trends. This discovery has led to an addition subsection, 2.4, that discusses this and how it is handled.

– We have clarified that SAGE trends are a function of altitude, and SBUV as a function of pressure in the text and the Figure caption.

Minor Comments:

pg 12390, line 12: What is the % difference at layer 7 (increases to 10% in layer 10) ?

– About 2%, which was added to the text.

pg 12390, line 19: errors in the satellite ephemeris in January... all Januarys?

– All Januarys

pg. 12394, line 18: It might be worth noting here other recent comparisons with SBUV(/2) data that corroborate your results (

– They corroborate our results although it is not that straightforward in as much as different averaging has been used in time and space. But yes, this is worthwhile and has been done,

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pg 12390, line 22: repeat of word “lifetime”

– Corrected.

pg 12390 line 29 – pg. 12391, line 1: reword. “For all SBUV-SAGE II coincident pair measurements at each latitude : : :

– Done.

pg. 12395, line 3: 2000(?) and typo replace tro with top pg. 12396 line 14: et al.

– ‘(?)’ removed, and corrected.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 12385, 2009.