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Atmospheric Measurement Techniques Discussions

Interactive comment on "Assessment of Odin-OSIRIS ozone measurements from 2001 to the present using MLS, GOMOS, and ozone sondes" *by* C. Adams et al.

Anonymous Referee #3

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The paper present assessment of 11 years of OSIRIS ozone data set and address its suitability for trend studies. OSIRIS ozone profiles are validated against MLS, GOMOS and ozonesonde measurements. It also investigate possible sources of the observed biases, mainly optics temperature, ascending /descending differences and albedo. The authors also calculate global instrument drift using the same data set.

In general, the paper is clearly written and structured. The paper should be accepted for publication after addressing the concerns mentioned below.

In Section 5.2 the authors try to characterize the OSIRIS biases against optics tem-

perature, aerosol extinction, and albedo. This section is rather incomplete and need further revision and proper discussion of the observed biases. See comments below.

Specific comments:

The authors need to specify the reasons for using MLS v2.2 rather than v3.3?

Page 3827 last paragraph: can you further explain how do you calculate the correlation coefficients for all altitudes?

Page 3828, line 26, 'Correlation between OSIRIS and GOMOS is slightly weaker, due in part to the smaller variability in the ozone profiles for the OSIRIS and GOMOS coincidences' I don't agree with this statement, a weaker correlation coefficient indicate a weaker agreement regardless of the variability.

Page 3829, line 24, 'No other bias at altitudes above 24.5 km is consistently larger than 5 % in all validation data sets.' This not exactly accurate, as both MLS and GOMOS comparison show bias of >5% in southern hemisphere at high latitudes in the southern hemisphere. Please revise this statement.

Page 3830, first line: "Large positive percent differences are observed below âĹij 20 km at southern hemisphere high latitudes for comparisons with MLS, and are associated with large standard deviations. These values do not improve when only southern hemisphere summer months are considered, suggesting that this is not due to polar stratospheric clouds" Actually, below 20 km, the negative bias of >5% stand out and is more significant than the positive bias. Can you comment further on this bias? Does it persist when you restrict the compassion to summer months?

Page 3830,line 15: "For tropospheric air, 2–5 km beneath the tropopause, strong correlation R > 0.9 is observed between OSIRIS and ozone sondes, suggesting that OSIRIS is capturing tropospheric variations, despite mean percent differences of up to 15 %." I'm not sure I understand why there is a strong R below the tropopause, when the standard deviation is very large at this region. You might need to present the comparison

in different way (maybe a plot of the time series) to illustrate that “OSIRIS is capturing tropospheric variations”

Page 3831, Section 5.2.1: I find some discrepancies between the text and fig 5. At temperature <16 C, the MLS comparison show very small negative or zero bias, not bias up to 6%, thus make it inconsistent with with SAGE II comparison, which show negative bias of 5-12 %. The second paragraph and fig 6 also add to the confusion. If you are investigating altitude pointing errors, then showing the comparison at 32.5 km is not proving anything. I suggest plotting the mean ozone profile for OSIRIS, MLS, and GOMOS for T<16 C, and then look for any obvious altitude mismatch.

Line 12, “This supports the explanation that a low bias in ozone measurements is caused by altitude pointing errors and/or lower spectral resolution under low optics temperature” Can you explain why lower temperature would cause a lower spectral resolution? Why you think that pointing errors and wavelength error have the same effect on the ozone retrieval? Please revise the text for the whole section.

Page 3831, Section 5.2.2: comments on fig 7: I don’t see the author’s point about the bias at 22.5-24.5 km northern and southern hemispheres. The larger positive bias in the northern hemisphere descending node is prescient for most altitudes for MLS, not only 22-24 km. Similarly, the positive bias in the southern hemisphere is evident for all altitudes above 20 km for GOMOS and sonde comparison, and at 14-25 km for MLS comparison.

Page 3832, line 11: “Therefore the observed latitudinal structure in comparisons between ascending and descending nodes and the validation data sets is not caused by the different seasonal coverage of the ascending and descending nodes.” I don’t think the authors have clearly shown this to be true. Fig 1b show a clear differences in the seasonal and geographical ascending/descending coverage, where most of the high latitude measurements between 60-90 for both N and S, are from ascending node. Surly this will create some biases when you compare ascending and descending mea-

surements.

Line 20 and fig 9: I don’t know how much can be concluded by looking at 22.5 km. This might be the peak of the aerosol layer between 30 N and 30 S, but this is not the case for northern and southern hemispheres, where the peak is closer to 15 km. In Fig 9 a and b, it’s unclear why the ozone difference increase at higher latitudes, when the magnitude of the aerosol decrease? The authors need to revise this section and clarify their conclusions.

Page 3833, section 5.2.3: The analysis in this section are incomplete and don’t add to the paper. I suggest either redo the analysis or delete this section. In general, albedo errors contribute to $\sim$1.5%, and are almost negligible above 35 km, where the UV wavelength are used. As the authors noticed, the bias seen at 42km can’t be explained by the albedo error.

Section 5.3: the authors calculate the drift against MLS, GOMOS, and ozonesonde measurements. Can you comment on the stability of these measurements?

Technical comment:

I fined it a little confusing the use of “high” or “low bias”, I suggest using “negative” or “positive bias” instead.

P3828, line 11-12: replace “are within 5% of zero at all altitudes’ to ’are within 5% at all altitudes’

Fig 2 a,b and c: title should be OSIRIS – MLS, OSIRIS – GOMOS and so. Also, the x-axis title should be moved from the y-axis side.

Fig 5: replace “Variation in percent differences” with “ Relative mean difference”

Fig 6: replace “OSIRIS minus MLS” with “OSIRIS - MLS”

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 3819, 2013.