

## ***Interactive comment on “A global climatology of stratospheric OCIO derived from GOMOS measurement” by C. Tétard et al.***

### **Anonymous Referee #1**

Received and published: 10 June 2013

Review of: A global climatology of stratospheric OCIO derived from GOMOS measurements.

By Tétard et al..

This is a nice paper that describes a new approach to the retrieval of OCIO concentration information from the GOMOS instrument. The work is sound, the results are believable and interesting, and the paper is ideally suited to the AMT journal. Nearly all of my comments are stylistic in nature, and can be implemented in a fairly short time frame.

I only have three substantive comments. The first is that the authors seem unduly wedded to discussing and showing their results in the form of a slant column density.

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While this may be appropriate when comparing to their correlative measurements, it is a significant barrier to the comprehension and use of these results by the wider atmospheric chemistry community. Given that they clearly have the capability, I would strongly encourage them to recast much of their discussion in terms of either concentration in molecules per  $\text{cm}^3$  or, better still, as a volume mixing ratio. The latter would allow direct comparison to  $\text{ClO}_x/\text{ClO}_y$  measurements from other sensors (and hence to studies of chlorine partitioning etc.) and far easier comparisons to models. Granted, a vmr calculation requires knowledge of temperature and pressure, but estimates of these from meteorological analyses are readily obtainable, and uncertainties in these, while non-negligible, would probably not significantly impact the resulting vmr estimate. Specifically, I recommend the discussion in section 5 be recast along these lines, and that figures 5,7,8,9 and 10 are converted to these quantities.

My second major comment centers on the discussion on page 3524, starting around line 22 ("Overall, the conclusion..."). Given the poor comparison with SALMON, I think you need to say more. Even though not all the comparisons are encouraging, there is still presumably information in the GOMOS temporal and geographical variability - the main results of your paper. Can you do some kind of bottom-up estimate of how reliable this information is? A harsh reviewer might try to discount any features in your results smaller than  $\sim 0.5 \times 10^{-8} \text{ cm}^3$  (the peak size of the GOMOS/SALMON bias). You would need to make such "stability" arguments to counter him/her, and would presumably win those arguments, so why not make them here anyway.

Finally, I did not see figures 9 or 10 discussed in the text. Either talk about them or delete them. Any discussion of them would probably need further review, so it's probably easiest to delete them.

Minor comments

— Abstract

Line 17: Be more quantitative than "generally satisfying" (this is the abstract after all.

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Line 21: Similarly, quantify the "strong concentrations"

— Page 3513

Line 3: "physico-chemical" -> "physical and chemical"

Line 4: "It appears that the halogen..." -> "Halogen"

Line 10: "toward" -> "into"

— Page 3514

Line 1: Insert "wintertime" before "permanent"

Line 4: Consider defining the polar vortex a bit for the less familiar reader.

Line 17: This discussion is a little disjointed. You begin by saying there haven't been many measurements, but then your "for example" list gives what feels like a large number of cases, with no comparable list for NO<sub>2</sub> for comparison. I suggest rephrasing by turning it the other way round (something like: "Previous OCIO measurements have included.... This represents a very small and disjoint collection of observations compared to the large array of [space / airborne / ground / etc., delete as appropriate] observations for species such as NO<sub>2</sub>.")

Line 24: "In this study" -> "In our study"

Lines 27 - first 3 lines of next page. This discussion is awkwardly worded. You introduce OSIRIS and SCIAMACHY but then don't really say why you're not discussing them. The SAGE discussion is clearer, but again the English is clumsy.

— Page 3516

Line 17: "scintillation is right" -> "scintillation, while correct "

then Line 17: add comma after "plane)" and replace "but" with "is" so: "plane), is"

Line 26: "is in fact made up of" -> "comprises"

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— Page 3517

Line 6: "algorithm" -> "algorithms"

Line 19: "written previously" -> "discussed above"

— Page 3518

I think the "bullets" discussion would be easier to write (and thus easier to read) if you fused #2 (temporal) and #3 (latitudinal) together into one discussion.

Line 13: Add "dark" or "low" before "straylight"?

Line 15: "These measurements are supposed" -> "Such measurements can"?

— Page 3519

Line 8: "should be" -> "are"?

Discussion around line 15: Why not use some coordinate like PV or equivalent latitude to get round this problem completely? It would also enable far more useful comparisons with models etc. Also, what happens to the signals when you look across the vortex edge? Is that a "third class" of observations?

Line 26: Presumably this weighting is by noise? It should be stated.

Also, please state why the median was chosen rather than the mean?

— Page 3520

Line 1: "values" -> "value"

— Page 3521

Line 16: "differences" -> "difference" (or "is" -> "are" above)

— Page 3522

Line 14: add "+" before the second "10" for symmetry (or say within +/-10%)

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— Page 3524

Line 1: Perhaps give a rough percentage for "above"

Line 13: "Moderate" is a rather unclear word in this context. Would "less encouraging" be better?

Line 22: See substantive comments above.

— Line 3525

Line 4/5: More discussion needed - why a Lorentzian (capital L needed by the way). What is the physical basis for that choice of function? Also, what is meant by "retrieval errors" here? (precision? accuracy? observed biases?)

Line 20/21: Perhaps give a rough numeric range here.

— Page 3526

Line 1: Does MLS say anything about the variability of this region that could help interpret your observed variability?

— Page 3527

Line 2: "remove" -> "removed"

Discussion around line 10: Do Polar Stratospheric Clouds have any impact on GOMOS observations. If so, describe the impact and your methods for alleviating it.

— Figures

Figures 1 to 3 and their captions have become confused. I will try to be as clear as possible when discussing them.

The latitudinal coverage figure (above caption labeled Figure 1): Consider a smaller (filled?) symbol size for clarity? Also, in its caption (labeled "Figure 2"), and in the text it, should be made clear that (or if?) this is just the OCIO observations or all GOMOS

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observations. I suspect it's the former.

Figure 4: The x-axis on the bottom left plot is unclear as there is only one number. Why use a log scale anyway, this is a mean residual, so presumably negative numbers are allowed? Do we expect it to be logarithmic?

Figure 5: Change to density or vmr (or have one SCD one density/vmr panel).

Figure 6 - last line of caption: How are these errors defined? Precision? Accuracy?

Figure 7: A lot of wasted white space. Drop x axis for all but bottom row, y axis for all but leftmost column, make plots larger and closer together. Perhaps label x-axis "latitude" rather than " $\phi$ "

Figure 8: Last line of caption: "differs" -> "differ"

Figure 9: Are all the points in the right hand panel included in the fit?

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Interactive comment on Atmos. Meas. Tech. Discuss., 6, 3511, 2013.

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