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Atmospheric Measurement Techniques Discussions

Interactive comment on "Retrieval of ozone profiles from OMPS limb scattering observations" *by* Carlo Arosio et al.

Anonymous Referee #2

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==== General comments

This is a nice paper that does a good job of introducing a new OMPS-LP retrieval approach and describing the dataset resulting from it. I see this paper as ideally suited to the AMT journal and a welcome addition to the body of literature. My comments are all pretty minor and mainly involve requests for further clarification or suggestions of wording changes etc. I'm confident that, once these are addressed, the paper will be ready for publication.

Before I provide some line-by-line comments and suggestions, just a few "global" thoughts. In several places the paper presents comparisons between the IUP-OMPS and another dataset without (that I could readily find) being completely explicit about whether it's <IUP-OMPS> minus <other> dataset that's being presented (as I'm pretty

sure it is) or the sign is reversed. Furthermore, when a percentage or relative difference is shown, you should be clear about what is in the denominator, is it IUP-OMPS, the other dataset or some combination of the two?

The abstract and introduction talk about this paper setting the stage for a potential "combined" dataset linking this new record to the SCIAMACY observations. It would be useful to return to this point in the conclusions section and briefly discuss the consequences of your findings for such an activity. Which of the factors uncovered in this analysis might present challenges to such data fusion?

Finally, I'm aware of at least on other team developing an OMPS-LP data record, that being the OSIRIS team in Saskatoon. Depending on the availability of data from that team, it's worth considering the possibility of expanding section 4.1 (or adding a new section) that at least discusses their approach and its similarities and differences from yours and the NASA one, and perhaps even performs an additional data comparison if appropriate.

==== Specific comments

—- Abstract

It would be good to spell out SCIAMACY and MLS in the abstract (if space permits)

—- Page 1

Line 20: Odd wording of 2nd sentence. How about "... in the atmosphere. It is most abundant in the stratospheric 'ozone layer', which absorbs..."?

—- Page 2

Line 18: For completeness, I suggest you add discussion of the GOZCARDS (doi:10.5194/acp-15-10471-2015) and SWOOSH (doi:10.5194/acp-15-10471-2015) datasets also.

—- Page 3

Line 8: "satellite missions" -> "satellite instruments"

Line 25/26: This needs rewording. First, OMPS is an instrument not a mission (the Suomi NPP missions has "stated aims" that go far beyond ozone). Secondly, while the OMPS-LP and OMPS-NP components are indeed focused on the vertical distribution, you've neglected the OMPS-NM mapping capability which has no vertical resolution and thus a different science focus.

—- Page 6

Lines 1/2: "further prior handling" is odd wording (further and prior sound contradictory), how about "additional screening or processing" or something similar?

—- Page 7

Line 3: Give a citation or more details on the "another scene-based technique".

Lines 7/8: This reasoning doesn't actually quite follow. Photons from any altitude can be scattered within the instrument to any other altitude. It so happens that there are more photons in the lower atmospheric views than the upper atmospheric one. The way it's currently written makes it sound more one way than theoretically can be (though granted, you do start with "For example").

Line 23: "In the preparation time of this paper" -> "At the time of writing this paper"

Line 33: Perhaps delete "the" before "North"?

—- Page 8

Lines 10-15: Please be explicit about whether "approximate spherical" is referring to the assumed shape of the Earth (as I assume it is) or to the shape of scattering particles. How does "approximate spherical" (line 12) relate to "pseudo-spherical" (line 14, page 9 line 1). Also how is all of this related to the oblateness of the Earth, are you assuming a spherical Earth surface but with a radius tuned to give approximately the same shape as the Earth ellipsoid along the line of sight?

—- Page 9

Lines 20-24: Please give more details on what this "shift and squeeze" is correcting (some instrumental anomaly?) and why this correction is necessary (also why it is not needed in the UV range).

— Page 10

Line 12: Typo with Tikhonov

Also line 12: If gamma linearly increases with height then it's a vector rather than a scalar surely (or even possibly a diagonal matrix). Please clarify.

Line 24: Insert "Level 1" after "normalized"?

Line 27-29: I'm not quite sure I understand this. It seems like you're preselecting which wavelength/height subsets of the Level 1 data to use based on the strength of the weighting functions. However, the retrieval factors those strengths in when deciding how much attention to pay to each individual measurement anyway. Why is this additional step, which, in effect, second guesses the retrieval, needed? If including the "weaker" signals has undesirable effects on the result, is it understood why that is? Also, this means that, potentially, each ozone profile was generated by a different "subset" of the instrument, making for a measurement dataset whose properties (precision, resolution etc.) are a moving target, complicating the development of average datasets, long term records, etc. Some discussion of the size of these effects would be good.

—- Page 11

Line 5: suggest "... to reject THs <with radiances> affected by ..."

Line 14: Insert "liquid" before "water"?

—- Page 12

Line 5: Start of line: "Aerosol extinction..." -> "An aerosol extinction..."

Line 6: "... has a coarser spectral resolution <than SCIAMACHY>, ..."

—- Page 13

Line 1: "downwards from" -> "below"

Line 15: "At the moment of submission of the paper" -> "At the time of writing"

Line 17: "... Fig. 8, which shows relative ..."

—- Page 14

Line 2: "AURA" -> "Aura"

Line 4: "satellite suite" -> "MLS instrument"

Line 8: Is there a reference or definition for "modified potential vorticity".

Lines 11-14: Please state what temperature/height information is used to do the density/height to pressure/vmr conversion?

—- Page 15:

Line 9: "... related to impacts of polar mesospheric clouds on the signals that were not successfully screened out of the Level 1 data" or similar wording?

—- Page 17

Line 16: "about" -> "into"

—- Figure 1

Wouldn't hurt to define TH, TP in the caption.

— Figure 2

Again, make figure more "stand alone" by defining "TP"

— Figures 8 and on: Be clear in each what the sign of the differences shown are. (Do it in both the body text and the figure/caption to allow the figures to "stand alone")

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