Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC2
https://doi.org/10.5194/amt-2022-116-RC2, 2022

Comment on amt-2022-116

Anonymous Referee #2

Referee comment on "Assessment of the error budget for stratospheric ozone profiles retrieved from OMPS limb scatter measurements" by Carlo Arosio et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2022-116-RC2, 2022

Review of:

Assessment of the error budget for stratospheric ozone proï¬les retrieved from OMPS limb-scatter measurements

by Arosio and colleagues.

----- General comments

This is a nice solid paper that does a thorough and robust job of quantifying the uncertainties associated with the Bremen group's retrievals of ozone profiles from the OMPS-LP instrument. My comments are only minor. The discussion is generally very clear and well motivated. The language and graphics are both of very good quality. I'm very happy to recommend this paper for publication pending the minor corrections that I detail below. I do not feel a need to review an updated version (but clicked on the "willing" button if the editor feels another read through is needed).

----- Specific comments

Line 2: I think the mission is now called the "Suomi National Polar-orbiting ..., Suomi NPP", right?

Line 3: I suggest rewording as: "The error characteristics are presented in a form that is compliant with ...". Note the spelling error on compliant (you have "complaint").

Line 8: Suggest rewording start of sentence to: "We have classified the various different error..."

Line 11: You have a short hyphen (single "-" character in LaTeX) for the first (3-50%) range, but longer ones ("--" in LaTeX, which are more correct) for the other two. Modify the first to be consistent/correct. There were some other examples of this issue elsewhere in the paper.

Line 12: "related" -> "due"

Line 13: saying both "absolute value" and quoting a percent (which many would see as a "relative value" is confusing). Please clarify, do you mean abs(error) - to use programming terminology? - expressed as a percent?

Line 13: What above between 20 and 50 km, would be good to quantify that in abstract too.

Line 18: Insert "Suomi"before "National"

Line 26: "was in the meantime" -> "has since been"

Line 41: Put commas before and after "as in von Clarmann et al. (2020)"

Line 43: Would it be better to insert "mainly" before "contribute" here? I leave it to you.

Line 55: Suggest inserting "in Sect. 2.1" after "instrument" for better flow/consistency. Then insert "of" before "the retrieval

algorithm" and delete "given"

Line 70: Suggest "increases" -> "coarsens". "Increased" resolution sounds good from an English perspective, but is worse from a numerical perpective if quantified in terms of a length. (Similarly precision/accuracy. I generally advocate saying coarser/finer and/or better/worse rather than more/less for all such terms to avoid ambiguity).

Line 81: Delete "what concerns"

Line 86: "... and are preconvolved with the OMPS-LP instrument line shape" ("are beforehand" is awkward wording).

Line 90 (and 95): Not being familiar with UV/Vis instruments, I hadn't understood/remembered that the Chappuis bands are not in the UV. Thus this paragraph was very confusing to me (is the shift and squeeze included or not?). I suggest you make that clearer by pointing out that the Chappuis bands are in the visible spectrum).

Line 91: "tells" -> "suggests" or "implies"

Line 94: Not sure what is meant by "differential absorption" here, I presume you mean fine-scale spectral structure, but it's not 100% obvious. Saying "differential" could mean from TH to TH. Please clarify.

Line 109: Suggest you delete "percentage" and then add ", expressed as a percentage of the true profile," after "reported" on the next line.

Line 118: Not clear what "actual" means in this context. Does it refer to the spacing of the levels in the state vector? (I forget if that was discussed anywhere in the paper). If so, then I'm not quite sure how the UV vs. Chappuis comes into it, so perhaps that's a bad guess on my part. Please clarify.

Line 131: Some inconsistency here, this discussion of the Gaussian generator and the multiplication by the SNR discussed in line 133 suggest that these "noise sequences" are Normal(mu=0, sigma=1).

However, the caption for figure 3 states that the lower panel is showing the "noise sequences" too, and these clearly have sigma smaller than 1.0. Not a big deal, I'm sure everything's been done correctly, but make the terminology consistent between the text and the figure caption.

Line 132: "Simulated spectrum" may be unclear here, as we're still dealing with real OMPS data, right, not the radiances corresponding to a modeled truth. Perhaps "fitted" might be better for this particular sentence, rather than "simulated"?

Line 134: Suggest you say 50 rather than N here, for consistency with earlier in the sentence (some may forget that N==50).

Line 136: "profile" -> "profiles" or "a first guess profile"?

Line 137: Clarify "unperturbed" here. It's clear to me that you mean you have yet to do any perturbations associated with parameters, calibration, spectroscopy etc., but readers less familiar may be confused as your 50 noise sequences are themselves perturbations.

Line 143: insert "is" between "what" and "ideally"

Line 143/144: "This feature" is vague - is it the point discussed in the preceding sentence or the whole of this paragraph. Please clarify.

Line 156: Suggest you change "shift-squeeze" in the math symbol to "shift&squeeze" to avoid confusion with a minus sign (\& in LaTeX). Also, the kerning for this and other things (e.g., "param", "fix", etc.) is wrong because you're in math mode. Suggest you use, e.g., $\sigma_{x, \text{shift\&squeeze}}$ (needs amsmath.sty) or, $\sigma_{x, \text{\textit{shift\&squeeze}}}$ if you prefer. And similar for others.

Line 166 / Table 2: For completeness/clarify you should state what these numbers convey. Are they ranges? 95% confidence intervals? 1-sigma (which is what I assume the are, from the contex), 2-sigma? This then impacts the interpretation of the resulting O3 uncertainties.

Line 168. The sentence here feels like it belongs at (or near) the end of the paragraph rather than at the start. Where it is now, it interrupts the flow of discussing the input parameter uncertainties.

Line 186: Suggest adding "radiance" before "noise" to remind people what you mean here.

Line 187: I wonder if the superscript "n" might not be better as an "i"? In any case, it should be defined.

Equation 7: I can sort of see why you call this a sigma rather than a delta, but it looks like it should be the latter from the definition, so take some time to explain to the reader why you're not labeling it as a delta. Indeed, it might be easier to explain if you talk about the Monte Carlo approach first rather than second. Then this delta-like parameter becomes an estimate of the associated sigma from the MC approach.

Line 214: "are going to be" -> "will be". Also, end of line change "fix" to "fixed".

Line 215: "... and conveys information on the relationship between the sign of the parameter perturbation and the sign of the consequent ozone perturbation."

Line 224: Would be good (here or somewhere else) to point out that you're changing Temperature at all heights by 2K, not just one height (or each height in turn, right?). Indeed there are multiple temperature, pressure, TH, and aerosol perturbations that could be made, but only one albedo one, correct? (Though hydrostatic balance, if you're imposing that, reduces the degrees of freedom for Temperature/pressure/TH perturbations) Perhaps discuss this more, and explain why you didn't consider more complex (i.e., height-dependent perturbations).

Figure 5 caption, line 2, insert "in the top and bottom rows, " before "respectively". Also, delete "- like" after "Monte Carlo"

Line 282: "It has to be taken into consideration that" -> "It should be borne in mind that"

Line 284: "On the contrary" -> "In contrast"

Line 285: "less" -> "fewer", or "a narrower range of" if that's a better description.

Line 437: "exemplification" -> "example"