Atmospheric Measurement Techniques Discussions

Interactive comment on "The Level 2 research product algorithms for the Superconducting Submillimeter-Wave Limb-Emission Sounder (SMILES)" *by* P. Baron et al.

Anonymous Referee #2

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This is a nice paper that gives a good overview of the SMILES research retrieval algorithms, and has useful examples of the characterization and error assessment of some high-profile SMILES products. It might have been nice to include some actual real retrieval results in the paper - a simple map of ozone, say. However, it is not essential for this kind of manuscript (and perhaps data protocol issues precluded it).

To answer the specific questions posed to reviewers:

In my view the paper is well within the scope for AMT, and presents novel measurements and ideas. Substantial conclusions are indeed reached, and the methods are

valid and clearly put forward. The description is complete and prior work is properly credited. The title and abstract are both well suited to their purpose, the presentation is generally well written and clear. The mathematical symbols are well defined and follow established conventions. One could argue that some of the detail could be reduced. Examples include some of the forward model discussion, and the retrieval iteration flowchart, both of which follow well-established routes. However, this would probably not save much space, as the new aspects that need to be described need to be set in a suitable context in any case, pretty much mandating a discussion of around that length.

I am very happy for this paper to be published in AMT if the authors can tidy up some of the issues I highlight below.

My comments are mostly minor and given below

—- Abstract

Line 6: This paper is about Version 2, was Version 1 documented in some earlier paper? I presume not given the level of detail in this paper.

Lines 12-18: This discussion is pretty heavy for an abstract. If you're going to include it, you might need to hold the reader's hand a little more and 'connect the dots' on the discussion at little more explicitly (e.g., by citing hydrostatic integration).

—- Page 3596

Line 11: In your discussion of the 'SMILES ground segment' I presume you're referring to the 'operational' retrievals (as distinct from these 'research' ones), correct? If so, do you want to make that explicit?

—- Page 3597

Line 1: Add 'for prior microwave limb sounding instruments' after 'tangent point pressure'?

Lines 2-6: You say how the research algorithms work and state that these aspects differ from the operational algorithm, but I think you need to be more specific about the approach taken in the operational algorithm, otherwise we have no idea about how big a difference you're talking about.

Line 27: More detail on the 'Calibration data' would be good (high space view? View to space through a different port? View of hot target? View of some other calibration device?)

—- Line 3598

Lines 10-12: The line of sight velocity varies significantly with tangent altitude (and more weakly with latitude due to oblateness/orbit eccentricity), are these taken into account in the correction? Are the channel shapes uniform (or well-characterized) enough to justify this shift rather than making this correction in the forward model?

Line 20: Cautions -> Caution

—- Page 3599

Lines 3-10: Probably more detail than needed

Lines 22: How is this exclusion decided upon? Is there a citation for that (probably worth a section in it's own right in someone's paper).

—- Page 3600

Line 8: How big an approximation is this (you don't have to actually do the interpolation to quantify this, you could simply quantify by characterizing the rms difference from one gridpoint temperature to the next in the stratosphere - that would give you an upper limit, and it's probably a small affect as you say).

Line 15: expected -> assumed?

Line 23: '... allows US to assume ...'

Line 29: angles -> angle's?

—- Page 3601

Line 15: Something funny at the end of this line (superscript atm)

—- Page 3602

Line 10: removed -> neglected

Line 12: '... atmosphere is ASSUMED TO BE horizontally ...'

—- Page 3603

Lines 9-19: Would be good to compare this to the models used by the MLS project in this region (you do cite the Read et al., paper).

—- Page 3604

Line 7: 'laboratory measurements' is way to vague. Is there some citation somewhere that details those you included. I recognize this may have to be a long list, but traceability is important.

Line 9: I'm not sure 0.1 K is enough, it feels too large for things like HOCl which are of the magnitude. Some discussion here would be good. Did you explore sensitivity to this?

Line 10-12: Did not understand the 5 regularly-spaced frequencies bit.

Line 15: 'arbitrarily' is definitely the wrong word here. I'm sure you thought about it - this word implies you didn't. 'Removed as they have only xxx K impact' would be the better way to put it!

—- Page 3605

Line 11: Would be good to define Trec for the unfamiliar. Some might think it's the actual temperature of the receiver hardware, not the 'system temperature'

—- Page 3606

Line 14: Can you give examples of components that have a 'small impact on chi squared'? Why do this in any case?

—- Page 3607

Line 18: Figure 2 is clearly in the wrong place, if you're only citing it now it should be something like figure 5. Please check the ordering of the figures.

—- Page 3608

Section 5.2 title: Errors -> Error

—- Page 3610

Lines 9-12: Here I think beta must be a b-like term, given the nature of the discussion. However, it appears in the 'x' slot in the 'y' function. Please clarify.

Line 23: I think it would be good to divide this subsection into two subsubsections, the first part (above this line) on 'approach' and the second part (below) on 'results/examples'.

—- Page 3612

Line 1: 'low' precision/accuracy is ambiguous. At face value these words sound like more is better, but quantitatively more is worse (the same is true for resolution). I would say 'better' or 'worse' and 'larger' or 'smaller' to be more explicit.

—- Figure 9

Why have a legend for the right hand plots, but have the wordy description of the colors in the left hand ones. Surely there is space for a legend (albeit not at the top right) in the left hand plots too?

Same goes for figures 10 and 12, and, for that matter all the other plots without legends (excluding averaging kernel ones of course).

<div align="center">C1326</div>

—- Figure 10

What does the black line mean? It can't be the total as it's less than the green one in some places.