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Atmospheric Measurement Techniques Discussions

Interactive comment on "CLIMCAPS Observing Capability for Temperature, Moisture and Trace Gases from AIRS/AMSU and CrIS/ATMS" *by* Nadia Smith and Christopher D. Barnet

Anonymous Referee #1

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This paper is an excellent contribution to the application of hyperspectral infrared remote sounding data. The CLIMCAPS algorithm was selected by competitive proposal and data are now reported to be available to the public. This paper serves to introduce users to some novel features of the dataset. The authors discuss several ways the data may be analysed particularly with regard to information content. The examples provided only scratch the surface of the possible applications but are a useful guidepost for users. The comparison of the technical details of the CLIMCAPS algorithm with the widely known Rodgers approach is very helpful. The discussion of averaging kernels is thorough and figures 11 and 12 provide real life examples of the concepts. The paper is appropriate for AMT and I recommend publication with minor revisions as

described in the following paragraphs, first as questions for the authors to consider and then some technical corrections.

Questions for the authors (all line numbers refer to the manuscript as originally posted):

1. Line 25. The statement from Smith, 2013, appears controversial if it implies we now have adequate data for earth systems analysis. Those of us who have proposed instruments since 2013 might dispute this. I suggest the authors either (a) add some context from the original paper (did they mean we have sufficient but inaccurate data, or data sufficient for some purposes but not others?) or (b) comment on this statement from the perspective of 2020 and CLIMCAPS.

2. Figure 1b. Is the CrIS-NPP noise for NSR or FSR, or does it matter?

3. Line 167 and 507. Are any data assimilated by MERRA2 always from a previous orbit? Then data are never absent because of cloudy scenes in this orbit if they would not be considered anyway and the cloudy criterion seems superfluous.

4. Line 171 and 498. Are these climatologies single valued profiles for all space and time, or do they have latitudinal dependence? Is a single CO2 profile used for all time, and does this make retrievals at one time favoured over another? It would be helpful to have a reference to the climatologies used.

5 Fig 2 caption. Likewise it would be helpful to have a reference to the Masuda model as there may be multiple versions thereof.

6. Line 199 and Table 1. The text implies that N2O and SO2 will be in the table and they are not.

7. Line 410. This seems the key point of the continuity mission. The authors have been admirably frank (line 441) in discussing some minor shortcomings of the present version. How would this re-evaluation be done? What will you look at? In particular are there theoretical criteria which can be used? What would be a success criterion for a continuity product?

8. Figure 6(d). The low DOF for ozone over Canada is an interesting feature not discussed in the text. Is it due to low ozone values, low temperatures, stratospheric warming, or something else? A sentence about the physical state would demonstrate the utility of the DOF analysis.

Technical corrections:

Line 10. Remove "individually" or rewrite the sentence as it is confusing

Line 159. hamper -> hampers

Line 270. least their uncertainty is -> lest their uncertainty be

Line 443. Remove "it is"

Line 444. absorption is -> absorption are

Line 459. least it introduces -> lest it introduce

Fig 9 caption. it's -> its

Fig 10 caption. paring -> pairing

Line 544. wants -> want

Line 545. and is thus -> and are thus

Line 566 and Fig 11 caption. Columbia -> Colombia

Line 605. exceed -> exceeds

Line 611. centred -> centered

Line 612. localised -> localized (the rest of the document is US spelling)

Line 634. No apostrophe in Rodgers

Line 661. CLIMCAS -> CLIMCAPS

Line 714. Retemote -> Remote

Line 829. propagation systematic -> propagation of systematic

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