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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The use of IASI data to identify systematic errors in the ECMWF temperature analysis in the upper stratosphere" *by* G. Masiello et al.

Anonymous Referee #2

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This paper presents a detailed investigation into the noticable biases seen in the 15micron Q-branch of AIRS and IASI. The conclusion that it is most likely the result of a large temperature bias in the upper stratosphere and lower mesosphere is important (although not totally surprising considering the lack of observational constraints at this level). It does indeed seem most likely that the temperature field is the most likely cause of observational bias.

Two very important aspects of the problem should be given more explanation than in the text:

1) Corroboration with other observations: There is a brief mention of some work with

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SSMIS. It would be good to expand on that if at all possible. The are probably alternative datasets that could be used (e.g., MIPAS). Have the authors fully reviewed any other work that might support their conclusions (e.g., both Bormann and Dethof at ECMWF have presented work with MIPAS in the context of the ECMWF analysis). At the very least some suggestions for further corroboration of these results would be useful.

2) The possibility that the spectral line parameters is the cause seems to have been given very little consideration in this paper (just over four lines in Section 4.1.2). Without further explanation, I cannot understand why this explanation can be eliminated so easily. If, as you say, "the current accuracy is ... hard to assess" then maybe more investigations need to be done (e.g., more corroboration with other observations) and these remaining uncertainties should be stated in the conclusions.

Line specific comments:

p. 22728, 3rd para: Do we expect the CO2 profile in the stratosphere to be driven by the AIRS observations (it would need to use the Q-branch!). It was my understanding that the observations have very little impact above the tropopause and the profile above there is constrained by the model.

p.22729, 3rd para: Again greater discussion of other data sources would be useful. Which SSMIS channels does Bell use to infer the bias?

p.22733, 2nd para: A lot of care has been taken to ensure accurate knowledge of the atmosphere below 400hPa. Do the channels we are interested in actually see these levels?

p.22733, 3rd para: Again does the assimilation of AIRS data really affect the CO2 profiles in the upper stratosphere?

p.22734, line 24: I don't think 3-4K is "slightly" colder.

p.22740, 1st para of section 4.1.2 Again please expand on why you think the large

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biases cannot result from spectroscopic error.

p.22741, last para.: As the temperature biases are much larger in the troposphere can we infer that changing the continuum has a much larger effect for spectral regions not shown in Fig. 18? I think more context is needed to fully understand this.

p.22742, 2nd para: I think you are over-emphasising the differences between the RT models. They both, as you note, use LBLRTM and they both use similar spectroscopy. If the bias is from the RT calculation, it is far more likely to be from something the models have in common (e.g., spectroscopy) than something that is different.

p.22742, 4th para: I am afraid this argument makes no sense. You are saying convolving the result of a spectral coefficient error with the IASI ISRF would result in broad features. Why would these features be any broader than the ISRF?

p.22743, 2nd para: The +/- 1K residual (after fitting) around the Q-branch is mentioned here in the conclusion, but not in the main body. I disagree that this shows there is nothing fundamentally wrong the the spectroscopy - it seems to imply some short of frequency shift in the absorption that may be indicitive of something more fundamental. Understanding this feature should give us greater confidence in the conclusions to this paper and would be a good topic for future research.

Typos etc:

p. 22728, lines 24-25: Remove "at any rate".

p.22729, line 27: Suggest replacing ",that is," with a colon (:).

p.22733, line 6: Replace "where" with "were"

p.22735, line 21: Replace "is shown" with "are shown"

p.22737, line 18: Remove "version 33R1 of the ECMWF model (the so-called".

p.22741, line 4: "hypotesis" should be "hypothesis".

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p.22742, line 4: "center" should be "centre"

p.22742, line 14: "nigth" should be "night".

p.22742, line 19: "strucure" should be "structure".

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