

Interactive comment on “A comparison of OH nightglow volume emission rates as measured by SCIAMACHY and SABER” by Yajun Zhu et al.

Anonymous Referee #3

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The manuscript presents a detailed comparison of SCIAMACHY and SABER OH radiances which, given the large discrepancy between the atomic oxygen differences derived from both datasets, is really very important to be addressed quantitatively.

The paper is very well structured, with a clear motivation and a very good introduction to the field. The results are very important, particularly in the light of the significant differences in the atomic oxygen retrieved from both datasets. It is also well written in general, although it, needs some editing (at some points sentences are partially repeated). I am also listing some suggested writing changes and typos below. I therefore recommend the paper for publication in ACP but, before, I would like the authors address a couple of important points:

- 1) Although the differences found between the instruments are important themselves,

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the authors should expand the laconic sentence that "the differences may be explained by the radiometric calibration of both instruments". I believe both instruments have been well characterized and estimates of their errors been given. The authors should discuss if the differences found are or not within the calibration errors of the instruments. Could they attribute the differences to a given instrument? e.g. on the basis that the calibration errors are smaller for one instrument than for the other?

- 2) I would also like the authors comment on the expected impact of these differences on the retrieved atomic oxygen from both datasets. Can the current O differences discussed in the introduction be explained by these differences? Would they reconcile the O differences or, on the other hand, would they still support or even enlarge the O differences?

Minor comments and suggested minor changes and typos:

Line 8. Worth to state here already which one (SABER/SCIA) is larger/smaller.

Line 30. Just over 1+1/2 solar cycles. Worth mentioning it is still measuring.

Lines 44-48. Consider some merging. Some information is somehow duplicated.

Legend of Fig. 1. Include that they are "simulated radiances".

Line 56. Delete "between two adjacent tangent heights". It is redundant.

Line 57. from vibrational states 2 to 9 at -> from UPPER vibrational states in the range of 2 to 9 at ...

Line 58. Bring all that information (particularly the radiometric calibration) to the discussion on the reason of the differences in Sec. 4.2 below.

Line 62. Start new paragraph with "The SABER ..."

Lines 73-76. Consider remove or re-write and merge with the next paragraph the sentence "The SCIAMACHY channel ... for SABER".

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Legend of Fig. 2. Explain the meaning of the "fit" and "raw" symbols in the legend, so the reader do not have to read the text for understanding it.

Line 80. Mention here that rotational non-LTE is considered, and that it will be assessed later in the paper.

Near the end of page 4. About the method used when comparing SCIA and SABER radiances. Although probably the effects are small, I think it is more consistent to apply the SABER filters to the computed SCIA spectra and compared directly to the measured SABER radiances. In the way it has been done, by comparing with the "unfiltered" SABER radiances, the authors rely on the method used in SABER for unfiltering the radiances, e.g., in an OH model, which might be different, from that used in the retrieved OH radiances from SCIA.

Line 86. monthly zonal MEAN?

Line 97. ... dividing BY ...

Line 97. State that this equation is valid under the assumption of rotational LTE. And that rotational NLTE is considered later. Should not E_v be actually $E_{\text{rotational}}$ in Eq. 1?

Line 111, "b" not only includes the Einstein coefficients, but also the other factors accompanying n_v in Eq. 1.

Line 114. issue -> problem? Full stop -> comma? Consider re-writing.

Line 126 median -> MEAN?

Line 128. I believe the estimated effects of the temperature errors include not only the effects of temperature on the Einstein coefficient but also on the rotational populations (see Eq. 1).

Line 132. Probably worth to be clarified that the Einstein coefficient errors enter not only through the retrieval of SCIA, as it is described in the paragraph above, but also

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through the A of the transitions of the SABER measured bands (which was not described in the paragraphs above).

Lines 138-139. Consider rewriting this sentence (somehow redundant with previous one).

Line 165. "A strong annual oscillation..." In the radiances or in the differences?

Line 169. Delete "here".

Fig. 4. I would suggest to use different line styles for SCIA and SABER? and/or use larger symbols.

Lines 187-189. Please see my two major points above.

Fig. 6. Right panel. The error of "b" is 0.00. Please, revise it.

Fig. 7. Slop -> slope? Both, in the legend and in the y-axis label. Is there any reason for the sudden drop in the slope in 2010? Please comment on it.

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