

# ***Interactive comment on “Validation of the IASI FORLI/Eumetsat ozone products using satellite (GOME-2), ground-based (Brewer-Dobson, SAOZ) and ozonesonde measurements” by Anne Boynard et al.***

## **Anonymous Referee #1**

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General: The article “Validation of the IASI FORLI/Eumetsat ozone products using satellite (GOME-2), ground-based (Brewer-Dobson, SAOZ) and ozonesonde measurements” submitted to AMT by A. Boynard et al. describes comparisons between IASI O<sub>3</sub> retrieval data products and several other O<sub>3</sub> data sets. They employ the FORLI version v20151001 retrievals. They used various time periods within the overall periods of observations IASI-A (2008-2017) and IASI-B (2013-2017) for overlap with other instrumental observations. The data have global coverage and is used in intercomparison between -A & -B. Other latitudinal or hemispheric comparisons are made with sparse

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ground based observations. Comparisons are also made with total and partial column products.

Overall the article describes comparisons with 4 different datasets in a logical manner. There is considerable detail for any one of the comparisons that could be clarified better. That descriptions are brief may be necessary since there are several datasets to describe and there are references to previous work. Still the main points are not as forthcoming as they could/should be. There are no new techniques nor sophisticated procedures or concepts hence it should be clear where and especially why the comparisons are the state they are in.

This intercomparison is nearly identical to a previous comparison by the same author Boynard et al., 2016 yet not mentioned much. This current paper describes the latest FORLI version and the previous paper a previous FORLI version. But that hardly makes this new work, in fact many plots and tables are identical. This work should be cast as an update and a comparison to the previous FORLI version. In this way specific details on how the new version improves or changes O3 columns and partial column data are explicit. This is a large shortcoming of this submission and should be remedied before publication.

The IASI O3 retrieval is performed in the 1025-1075cm<sup>-1</sup> IR region. Yet there are no comparisons with IR derived data sets. Such a comparison would diminish any discrepancy with cross section differences between IR and UV / Vis. This comparison would be seen as more thorough and results very interesting to take advantage of IR ground based datasets. Further, in particular NDACC IR data have vertical information comparable to IASI (DOFS ~>4) to use for partial columns. Secondly, there is little discussion given to any contribution of cross section differences.

Specific: Throughout the text the adjectives 'good' or 'generally' are used in descriptions of a comparison. These qualitative comments do not help the reader nor are they appropriate. They are subjective and are detrimental to a real grasp of the state of

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the IASI data with regard to other pertinent datasets. There are many uses of approximately ( $\sim$ ) or less than ( $<$ ) that seem inconsistent and hence tend to obfuscate the real quality of the data.

Here are specific issues with the scientific points being made. 1. P1, L23 Brewer & Dobson TOC are not retrievals per se.

2. P1 L25 to wit “shows good long term stability” good relative to what?

3. P1 L 29 “Compared to ozonesonde data, IASI-A and IASI-B O3 products overestimate the O3 abundance in the stratosphere 30 (up to 20 % for the 150-25 hPa column) and underestimates the O3 abundance in the troposphere (within 10 % for the mid-latitudes and  $\sim$ 18 % for the tropics). This sentence is needlessly confusing mixing zonal and altitude comparisons and using hPa layers as a “troposphere”.

4. P1 L32 “small” compared to what?

5. P2 L21 “180 shift” is not clear. It’s a shift in what?

6. P4 L24 what is a O3 profile “C-shape”

7. P5 L 9 “ Differences between IASI-A and IASAI-B. Is the plot A-B or B-A ? More generally for all comparisons in this paper most are ambiguous on this simple point. Every instance in the text and captions should be made explicit.

8. P6 L2 ‘excellent agreement’ How is excellent agreement defined? Is there a reference for comparison of spectra?

9. P7 L21-27 Here are given possible sources of differences at high latitudes between IASI & GOME data. They are apparently (per reference) the same or very similar to Boynard 2016. These do not help the reader know if and/or how FORLI v20151001 is an improvement. For instance given GOME data quality and known issues with UV/Vis retrievals from GOME, what changes in v20151001 make it an improvement over v20140922? More specifically i) ‘limited information content. . . low surface temper-

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atures'. Is this due to lower spectral SNR? Or something else? ii) misrepresentation of surface emissivity is vague. Are these values have large errors? Or have large biases or both? Is there a reference? iii) if the temperature profiles are known to be less reliable this implies variability not necessarily bias (but this list is describing a GOME/IASI bias. Further what magnitude temperature error delivers the O3 bias seen?

10. P8 L1 Is there some explanation what the physical basis is for the rejection of data over deserts and Antarctica?

11. P11 L18 Its not completely clear are all comparisons of the upper most partial column to 10hPa despite the statement to the contrary on L17 (25-3hPa)?

12. P11 L22 What is the source of the extremely low O3 in the UTL? Is it low in the sonde, IASI or both? How much data is lost?

13. P12 L8 It is very reasonable to follow that the high variability in the UTLS give large SD but less so to see what the a priori has to contribute given DOFS  $\sim 1$ .

14. P12 L14 Its not clear what information is missing? The comparison is to 10hPa for both instruments – is that correct?

15. P12 L29 Please clarify are these 40 pairs globally?

16. P13 L21 Please provide a reference for the stability of the IASI radiances.

17. P13 L31 use of the adjective generally is not helpful.

Technical: 1. P1 L19 what does ir “generally consistent” versus just “consistent”

2. P1 L23 “retrieved ones” would better be “retrieved TOC’s”

3. P1 L24 “on the instruments” would better be “on the compared instruments”

4. P1 L30 (up to 20 % for the 150-25 hPa column) should be (up to 20 % for the 150-25 hPa partial column)

5. P1 L30 “within” might better be “less then”

6. P2 L 4 “amount” should be “amounts”
7. P9 L2 ‘latitude belt’ might be better worded ‘latitude band’
8. P3 L11 “overestimates the ultraviolet (UV) Total Ozone Column (TOC)” Do you really mean to differentiate the uv TOC from some other spectral region?
9. P5 L19 ‘posteriori’ should be ‘after’
10. P5 L 31 remove second ‘between April. . .’
11. P6 L1 ‘proved’ might better be worded ‘shown’. Frurthermore is there a reference for this statement/conclusion?
12. P6 L13 ‘being preferentially be used’ might better be worded ‘are recommended’.
13. P12 L20 From plot 14 I read +1.5 & – 3.5 % difference (not +- 3.5) and SD of maximum 14.6% (not 14)
14. P12 L 23 Dobson units (sp)
15. P12 L28 . . .O3 partial columns. . .
16. P13 L20 . . .proven to be very. . .
17. P14 L7 ‘better from October’ might be better worded ‘better after October’
18. P33 caption, use of the term ‘sub’ column should be removed (in all cases) and partial be used for consistency.

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