

Interactive comment on “Quality assessment of the Ozone_cci Climate Research Data Package (release 2017): 2. Ground-based validation of nadir ozone profile data products” by Arno Keppens et al.

Anonymous Referee #1

Received and published: 17 March 2018

The article is in general very comprehensive and detailed. The level of detail is very useful, but so dense it is easy for the reader to get lost. Several tables and figures would benefit greatly by additional labeling to orient the reader. Particularly figures with multiple panels should be labeled with instrument names, reference quality, etc as appropriate so that at a glance the reader can identify what distinguishes one panel from another, and one figure from the next for those that are very similar in appearance.

The ordering of two sections seems illogical. This is based on the concept that the satellite data should be fully discussed before discussing the FRM. Yet a sentence in

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the section on screening implies that the screening is not solely based on satellite data quality, but additionally on coincidence opportunities with FRM. If this is the case, the order presented makes sense, but how and why the coincidences with FRM factor into the screening is not motivated or explained.

The section describing the L3 data gridding process is not clear for the novice, and overkill for an expert. Choose your audience, and make adjustments.

Detailed comments follow.

P2, line 16-17: Needs references for SBUV/2, GOME and OMPS.

Section 2: An introduction to the orbital characteristics of the satellite vehicles will be useful for the reader to better understand the later discussions on gridding and co-location of ground data. The beginning of Section 2 might be a good place for such a discussion.

Table 1: Additional columns indicating physical characteristics (vertical units/resolution/range, horizontal grids) of the measurements would be useful. These are all discussed in the text, but Table 1 is an opportunity for easy reference.

P5 line 23: Change 'has to stay' to 'must stay'.

P6 line 14: The A priori for RAL and FORLI are both constructed from the same source as indicated. Are they also both global? It is not clear from this statement.

P7 line 7-9: Are these rejected data included before or after the 'screening' discussed later in the paper?

Section2.4 L3 monthly gridded data: This section is not needed for experts in gridding data, and not helpful to the novice, so it is not clear who the authors are writing to. Figure 1 and this section would benefit for a discussion of the orbital characteristics of the satellite vehicles (either here or at the beginning of Sect 2 as suggested.). Also relate A, B,... and 1,2,3... to the physical items they represent. Refer to the profiles

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of the L2 data, and the grid points of L3. If A, B, etc. are the grid points, and 1, 2, 3 are the L2 profiles (and it is not clear that this is the case), is there an advantage to this approach of 4 grid points defining a rectangle, and subdividing the enclosed area, or is it the same as creating a rectangle around a grid point and assigning all profiles within that rectangle to the grid point? The latter seems so much simpler conceptually at least to a novice. What is the subtle missing difference?

P7, line 21: Is there a reference for the GOME/GOME2 convention?

Caption to Fig 1: Why is TM5 assimilation grid referenced here? This figure is used to illustrate the creation of L3 data, not the assimilated L4 data.

Section 2.5: There is a detailed, though difficult, description of how to create the L3 gridded data, but no discussion of how to move to the 2x3 degree L4 grid. This is confusing since Fig 1 refers to the transport model. This needs a little clean up.

P8, line 9: 44 ozone layers in what altitude range?

Section 3 leads with a description of the layout of the next several sections. This is very helpful given the complexity of the paper. But it is unclear why the choice is made to shift at this point to a description of the FRM data before completing the discussion on information content (screening) of the satellite data. Are these not separate concepts? Why not continue with the evaluation of satellite, and complete it before moving onto the description of the FRM? (See also related comment in section 4.1 specifically P12, line 14.)

P8, line 27: 'data harmonization' means different things to different people. Many think of it as bias correcting as a step preliminary to combining data. Perhaps use 'harmonization of data reporting units' to clarify.

P 9 line 17: It would be beneficial to add a line or two about the additional screening criteria used in this study and Hubert et al. 2016 for the ozonesonde data.

P 9 line 26: State measurement variables and resolution for the lidar as a parallel to

the ozonesonde description in the previous paragraphs.

Figure 2: When ozonesonde is removed as an FRM for the level 4 data, there is little left in the tropics to validate L4.

Section 3.3: As previously noted in section 2, knowledge of the orbital characteristics of the satellite vehicles would help in the understanding of the points in this section.

P10, line 13-14: Do you mean within one month (+/- one month) or within relevant month?

Table 4: The column name SPI needs more explanation. How to the numbers in this relate to Figure 1?

Section 4.1 Data Content: It is not clear how a measure of percent of data screened is a measure of data content. It is apparent that the desire is knowledge as to the distribution of the satellite data in latitude and time. It is noted in the description of Figure 3 that for IASI-A, there is little data removed by the screening process leaving a featureless contour implying an even distribution of data. But it is also stated that this is due to prescreening of data before release by the data providers. This technique does not show where the pre-screening removed data. Instead a more relevant measure of content and distribution would be the absolute number of measurements left after screening and its latitudinal and temporal distribution. P12, line 15: How can the latitudinal striping in the UVVis instruments be partially 'due to station overpass' if the screening is solely based on criteria in Table 3? Is screening based solely on data quality, or also on co-location? Additionally what data is in the CCI data release? Only the screened data? Only the screened co-located data?

Figure 3: This figure (and many after) need additional labeling. Label each panel with the satellite name so it is obvious at a glance.

Figure 3, first panel: What causes the gap in the GOME dataset after 2003 in the tropics?

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Figure 3, caption: What is meant by ‘The decreased BOME-2B data from 2015 onwards justifies additional screening’ mean? Are you trying to say that it indicates additional screening?

P14, line 5: change to ‘understanding of how the system. . .’.

Figure 4: Label each panel with the satellite name.

Figure 4, first panel: Why is the area in the tropics of missing data in the GOME panel larger than that in Figure 3?

P17, line 20: From here after there is inconsistent use of BG and of Backus-Gilbert. BG is used extensively in the Figure labels and captions, and occasionally in the text. Introduce the acronym here, then use BG only after.

Figure 5: This figure is difficult to interpret and needs more explanation and labeling. Label the columns with the instrument name. The offset in the second and third rows are labeled identically, but the graphs are different. The caption only states that ‘different measures are used’. Are the measures direct and centroid? Differences in the measures for width are clearly indicated. Offset could also be simply added by label and in the caption.

P20, line 22: change ‘fiver’ to ‘five’.

P21, line 18: Here 68% interpercentile spread is used for the first time, but the acronym IP68 is not introduced. Later in the text and graphs there is inconsistent use of the acronym and the full term. Introduce both here, and consistently use the acronym, or the full name in later text.

P21, line 26-27: Should ‘vertical averaging smoothing’ be ‘vertical smoothing’?

Figures 6-10: These are very hard to distinguish when trying to compare the results. Label each figure with the instrument and years (Gome 1996-2010 for example). Also label each panel with the influence quantity. These are stated in the caption, but are

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more easily interpreted if the panels are directly labeled.

Figure 11: Label the columns with Latitude and Quarter, and the rows with the instrument name for easy recognition.

Figure 12: Label the columns with L2, L3 and the rows with the instrument name for easy reference.

P39, line 10: Add the word ozonesonde: '64 ozonesonde stations'.

Figure 13 caption refers to top, middle and bottom instead of left, middle and right. Label each panel.

P40, line 4-5: The Southern mid lats do not look smaller but similar to the tropics in the UTLS.

P40, line 19: Replace 'As for' with 'Similarly to' and remove the word 'now'.

Figure 14, 15: Label each panel with the influence quantity displayed, and 'drift' in the final panel of Fig. 14.

Figure 16. Why is the time series shown for IASI L3, but not for others? It might also be enlightening to show the profile of the L3 drift.

P 51, Acknowledgements: Some of the NDACC PIs listed are retired. It might be of use to additionally include the current persons in these positions as is done for TMF.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2017-447, 2018.

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