

Interactive comment on “OMI total bromine monoxide (OMBRO) data product: Algorithm, retrieval and measurement comparisons” by Raid M. Suleiman et al.

Anonymous Referee #2

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General Comments

The manuscript gives an overview of the retrieval of BrO VCDs from OMI observations in the OMBRO data product. They then present a comparison of the retrieved VCDs to GOME-2 and ground-based observations at Harestua, Norway, showing general agreement with other BrO observations. Case studies of salt lake observations and volcanic eruptions are also presented, and uncertainties arising from the choice of SO₂ cross section are discussed. The topic is appropriate for AMT and the broader community would likely benefit from this publication. However, the presentation of the figures is quite sloppy and some aspects of the main text should be improved prior to

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publication. Specific comments are provided below to assist in this process.

Specific Comments

Introduction Referencing

I find the choice of references throughout the introduction a bit odd and in some cases not appropriate.

- Page 2, line 6: The knowledge of BrO in the polar troposphere predates both those references by a pretty fair margin. I'd suggest citing some of the earlier observations (e.g. Hausmann and Platt, 1994) or review papers on the topic (e.g. Simpson et al., 2007; Abbatt et al., 2012).
- Page 2, line 7: Hebestreit et al. (1999) should really be cited here.
- Page 2, Line 15: Again, this is a widely studied phenomenon that there are more appropriate references for. See suggested citations in my first comment.
- Page 2, Line 24: If this list is intended to be comprehensive, one should include observations at Alert (e.g. Zhao et al., 2015), Summit, Greenland (Stutz et al., 2011), and throughout the Arctic Ocean (e.g. Burd et al., 2017).
- Page 2, line 26: While many papers have been published on BrO observations at Barrow, Simpson et al. (2005), detailing studies of snowpack chemical composition, is not one of them. Please find a more appropriate reference for this location.

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Page 5, Line 8

Remove XtrackQualityFlags and other references to specific data field names throughout the manuscript. In a manuscript it makes more sense to say information is there without referring to a specific field in the data product.

Page 7, Line 16

Specify that the cross sections used can also be found in Table 1

Section 3.6 and 4.4

In my view, the discussion in section 3.6 fits better integrated into section 4.4 since it discusses an application of the data product, not the algorithm itself. Since measurements of halogens in volcanic plumes is a potential use of these data, I think a specific recommendation here would be helpful rather than just advising caution. Would it be an appropriate use of these data to examine BrO production in volcanic plumes?

Page 11, line 21

Since you are comparing 2 sets of satellite observations, orthogonal distance regression would be more appropriate than linear regression here. Linear regression assumes the uncertainty in the GOME2 VCD is much less than that of the OMI VCD, which isn't a valid assumption in this context.

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Page 12, line 17

Some context for this correlation would be helpful. How does this correlation compare with other ground-based vs satellite comparisons (e.g. Sihler et al., 2012)?

Page 13, line 28

Provide a reminder of what background values are here.

Suggested Figure Corrections

I'm aware some of these suggestions may seem pedantic, but I found the figure presentation really distracting. The suggested modifications would go a long way toward improving the quality of the manuscript.

- **Figure 4:** Fix y axis label BRO→BrO. Add reference to Operational SO₂ and BrO cross section, remove 1st SO₂ from Vandaele cross section label. For the sake of consistency, the convoluted Vandaele cross section be shown here rather than the raw laboratory cross section.
- **Figure 5:** Plot against the actual date and explain the large gap in OMI data in the middle of the plot.
- **Figure 6, 8:** These plots are really hard to read. Please consider an alternate font.
- **Figure 7:** Since you are only comparing the total BrO VCD in this work, showing just the time series of the total VCD from Harestua would be more useful than showing three different timeseries from Harestua. You don't really discuss the

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other two time series in any meaningful way in the text. Axis labels should also be added.

- **Figure 10:** This should be shown in tandem with a zoomed out map so the reader can orient themselves on the globe and also to show the magnitude of the enhancement relative to the background. The color scale as it currently stands spans a much larger range than that of the data, making it unusable. The map underneath the data is also barely legible.

Technical Corrections

Page 1, Line 27

Change "US Great Salt Lake" to the U.S. Great Salt Lake to be consistent with the rest of the manuscript.

Page 3, Line 17

30 pixels?

References

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