

We thank Anonymous Referee #2 for the constructive comments on this manuscript. Our response to points that the reviewer raises is denoted with bold text.

Section 3.1: I am not too impressed to the presentation order of Figure 4-7. The story telling in Section 3.1 begins with referral to Figures 5 and 7, followed by Figures 7 and 6 and then Figure 4. I felt uneasy while flipping pages back and forth many times until I understood the basic story. I suggest the authors to reorganize either the figure presentation order or the sentence order in Section 3.1 if at all possible.

We have reorganized the presentation order of the figures to match the referrals in the text.

Section 3.2, second paragraph: The description of the atmospheric stability on March 11 and 12 and its link to the mixing of BrO could be more specific. From the vertical gradient of potential temperatures, I can see that the lowest 200 meters of air was well mixed on March 11 and the lowest 300 meters on March 12. On March 11, however, there was a second layer between 300 and 800 meters where the air appears to have been mixed relatively well. If the authors believe that this second layer carried a significant amount of surface-sourced reactive bromine, they should say so explicitly.

Ground based measurements (Fig. 5) showed the majority of the BrO was in the lowest 200 m of the atmosphere, thus we do not believe this layer observed on the 11th carried a significant amount of surface-sourced bromine.

Section 3.3: You can make more sense of the vertical profile of BrO mixing ratios during the aircraft takeoff shown in Figure 11 by integrating over 0-2km altitudes and then comparing with the values of BrO LT-VCDs shown in Figure 9.

We modified the now Figure 9 to include LT-VCD information.

Section 3.4: It is not always clear to me what the authors mean by heterogeneous recycling, especially when they refer to the Hara et al. (2002) study at the end of the second paragraph. I normally use the term recycling when referring to conversion of gaseous halogen species into a more photolabile one, e.g., $\text{HOBr} + \text{HBr} \rightarrow \text{Br}_2 + \text{H}_2\text{O}$. If you refer to the reaction $\text{HOBr} + \text{Br}^- + \text{H}^+ \rightarrow \text{Br}_2 + \text{H}_2\text{O}$ where the bromide anion is directly provided from sea salt, I would call it a bromine explosion. I would like the authors to state this difference a little more clearly in Section 3.4. The abundance of the super-micron aerosols measured in-situ at 700-1000 meters aloft (Fig. 11) does seem to imply these particles are relatively fresh having been emitted either from open leads or snow-covered surfaces, even though I understand the reservations by the authors as discussed in detail.

Heterogeneous recycling in this context refers to heterogeneous reactions that regenerate BrO_x from HOBr and HBr that has deposited on particles. We have modified the text (pg. 12, line 21) in this section to clarify this point.

P2, L13 & L16: e.g ->e.g.

We made this change.

P2, L28-29: Add a comma between that and during.

We made this change.

P4, L12: Sihler et al. (2012) ->(Sihler et al., 2012)

We made this change.

P10, Figure 8 caption: Add the arrival date (March 13th) and time (either in UT or AKST) of the trajectories over Utqiagvik. Also, add the height (750 m) of central trajectory arrival.

We made this change.

P10, L19: daily soundings ->daily meteorological soundings

We made this change.

P12, Figure 10b (x-axis title): West Wind ->Westward Wind

We made this change.

P12, L17: Fig. 11 ->Fig. 11a

We made this change.

P12, L17: show ->shows

We made this change.

P12, L18: Fig. 11 ->Fig. 11b

We made this change.

P12, L21: Fig. 11 ->Fig. 11c

We made this change.

P13, Figure 11: Change the x-axis title BrO Molar Ratio ->BrO Mixing Ratio.

We changed this title to "BrO Mole Fraction" to match the text.

P13, L12: an initial ->a primary

We made this change.

P13, L14: Remove the comma after particles.

We made this change.

P15, the top line: or ->and

We made this change.

References

Oltmans, S. J., Johnson, B. J., and Harris, J. M.: Springtime boundary layer ozone depletion at Barrow, Alaska: Meteorological influence, year-to-year variation, and long-term change, *Journal of Geophysical Research*, 117, D00R18, doi:10.1029/2011JD016889, URL <http://doi.wiley.com/10.1029/2011JD016889>, 2012.