

Editor's comments:

Reviewer 3 suggested changes to the manuscript, that were needed to deal with the question whether or not the data can be used to demonstrate that ozone loss and bromine enhancements were “very fast”. The authors initially argued that the changes were happening *in situ*, caused by local chemical processes, and were thus surprisingly fast. However, Reviewer 3 (supported by earlier comments from Reviewer 1) concluded that the reason the changes were fast was because they were driven by transport, something which has been reported previously in the literature. The authors made some requested changes. However, they still present their results on the basis that the rate of change is surprising – if it is transport-driven, the rates of change are not surprising, and should not be over-stated; indeed such changes and rates of change, have been reported in previous papers. Therefore amendments to the manuscript are still needed in a number of places, to adjust the tone of their paper to reflect this fact.

There are two ways to address the major concerns raised. One would be the following:

- i) Remove the sentence (**page 1 line 18 to 20**) that states: “the ozone loss rate during the bromine enhancement period was 10.3 ppbv h⁻¹, which is extremely high compared to those observed in other areas”
- ii) On **page 2, line 32**, please change the statement “ a unique process event” and replace with “an event”
- iii) **Page 8 line 4 and 5**, change the sentence: “The concurrent changes in the chemical and meteorological variables demonstrate the impact of environment change on this ozone depletion/BrO event” and replace with “The concurrent changes in the chemical and meteorological variables demonstrate that changes in observed chemistry are evident because of changes in transport, albeit on a small scale”.
- iv) **Page 8 line 17 to 19**, please remove the first three sentences of this section; the section should therefore start “The deposition of gaseous mercury....”
- v) **Page 8 line 23**, remove the statement “The mercury loss rate is ~25 ngm⁻³h⁻¹ or 6 ngm⁻³d¹”
- vi) In the conclusions section, **Page 9 lines 2 to 7**, please remove all the text from “The concurrent changes in chemical and meteorological variables.....Further observations are required to identify its chemical mechanisms”
- vii) **Page 9 line 2**, alter the text to read: “By analysing the air mass history and sea ice conditions, this BrO enhancement event was found to more likely be a regional process, driven by changes in sea ice and transport on a local scale.”
- viii) **Table 2** should also be removed.

The alternative is that the authors ensure that every time they refer to the rate of changes calculated, they clearly state that these are most likely driven by transport, and then compare the calculated rates of change to those observed by others, and published in the literature. The context is extremely important.

I note also the Author's reply to the minor comment vii), regarding aerosol as surfaces for heterogenous reactions. The authors are correct, that sea salt aerosol has been shown to be an important source of bromine compounds to the atmosphere. However, they confuse the range of different surfaces which can act as a source. For example, in general, salty condensed phases can be a source of bromine compounds, and this can be achieved directly, and not only via producing

aerosol. For example, there is evidence now that frost flowers are not a source of aerosol, however they could still be a modest source of bromine compounds directly to the atmosphere. To address this the authors should remove mention of aerosol on **page 2 lines 6 and 8**. On **page 6 line 25**, they should change wording to read: "...frost flowers, which can provide highly concentrated saline surfaces, and also sea salt aerosol." They should also remove the label "aerosol" in **Fig 1**. My view is that the discussion of bromine sources would then be consistent.