

Interactive comment on “Inorganic bromine in the marine boundary layer: a critical review” by R. Sander et al.

R. Sander et al.

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1. The referee is correct in reminding us that NAA and PIXE measure both involatile organic and inorganic bromine. We now drop “inorganic” from our definition of the term “bromine”.

Regarding the title of the paper: Although total and organic bromine are briefly mentioned in the review, the main focus is on inorganic bromine. If the word “Inorganic” is deleted from the title, a reader who is mainly interested in organic bromine would be disappointed by our incomplete treatment of organic bromine. Therefore we prefer to leave the title as it is now.

2. The paragraph about high blanks in Nuclepore filters has been improved.

3. To avoid a generalization of the result of one campaign, the text has now been reworded to:

“For recent paired measurements of particulate Br in size-segregated and bulk aerosol samples collected in coastal air at Hawaii, Br in bulk aerosol samples was found to be conservative.”

4. We added Gong et al. (2002), as suggested by the referee.

5. We deleted “inorganic” in the sentence “. . . measurements of total inorganic bromine made by NAA (or PIXE). . .”.

Barrie et al. (1994) is an interesting paper that we have overlooked since we were focused on measurements outside of the Arctic. It is now mentioned in the text.

6. The referee mentions several points here:

- Regarding the necessity for a particle-size resolved model simulation:
Although such calculations were not available for this review, some of us (A. Pszenny et al.) have now submitted a manuscript to Atmos. Chem. Phys. in which the measurements from Hawaii 1999 are compared to such particle-size resolved model simulations. The model results indeed showed the anticipated discrepancy for the submicrometer particles.
- Regarding the explanation for submicrometer bromine accumulation:
The referee points to an important possibility that we have not mentioned so far. We agree that bromide can accumulate in sulphuric acid aerosols during Arctic ozone depletion events. Since there is no ozone, the activation chain is interrupted. In this case, there is no discrepancy with model results and we have added this to the text. However, there are no such ozone depletion events at mid-latitudes, and therefore we must also look for other potential explanations.
- Regarding halogenated dicarboxylic acids:
Yes, we agree that these acids may be present and contribute to total bromine. This adds to the need for simultaneous analysis of samples with IC and NAA.

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7. A thorough review of Arctic bromine chemistry is beyond the scope of this review. However, we have now added several references, as suggested by the referee.

8. The referee is right in stating that the data from latitude 53° N to 58° N show significant enrichment of bromine. Since all these data sets are from the North Sea, we ascribe this to anthropogenic influence. So far this topic has been scattered over several sections, now we have gathered the information in the new section “Correlation to anthropogenic influence”.

9. We agree that this section, which is based mainly on limited and partially unpublished data, is quite weak. However, this is not our fault but due to the sparsity of data. We have now added a call for more measurements of diurnal cycles into section 8 about future needs.

10. This comment probably refers to page 2987, not 2988. We think the referee refers to the following paper which I found mentioned on Sunling Gong’s web page:

Gong and Barrie, Simulating the Impact of Sea-salt on Global nss-Sulphate Aerosols, *J. Geophys. Res.*, 108 (in press), 2003.

We added a reference to it in the text.

11. Text changed as suggested by the referee.

12. Text changed as suggested by the referee.

13. Text changed as suggested by the referee.

14. Additional text inserted as suggested by the referee.

15. Additional text inserted as suggested by the referee.

16. Text changed as suggested by the referee.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 3, 2963, 2003.