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Interactive comment on “Overview of the 2007 and 2008 campaigns conducted as part of the Greenland Summit Halogen- HO_x Experiment (GSHOX)” by J. L. Thomaset al.

Anonymous Referee #1

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The paper by Thomas et al is an overview paper for the GSHOX project that took place at Summit Greenland in the late spring to early summers of 2007 and 2008. The paper is well written and succinct, as it should be. It does a good job of portraying what is exciting about this set of papers. Specifically, to me, the most important result is the implied presence of a significant reservoir of Br(y) in the free troposphere, which is providing a bromide loading to the surface snowpack at Summit. This observation/conclusion should spur additional experiments (which I think really should involve focused aircraft flights from the surface in the Arctic basin, to the free troposphere, aimed at speciating Br(y) compounds, and testing the hypothesis that Br(y) is transported from the Arctic basin surface into the free troposphere, and from there, dry and wet deposition can

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occur to the Greenland ice sheet. I think the paper could play up the significance of this conclusion, and better cite other papers that discuss this issue, e.g. those from the satellite column BrO community, which has been agonizing over this issue for years. Other than this, I have only minor comments, which are listed below in the order they appeared in the manuscript.

1. Motivation section - it might be useful to summarize why we care about this chemistry, i.e. where else you find bromine in significant enough concentrations, and how in general bromine might perturb radical cycles, e.g. those that determine global background O₃.
2. Page 17139, line 1, might say "BrO efflux from the snow...", and transport, not transported. Line 2 - I don't think it should be "MBL", should it be BL? Or do you mean to say from the surface of the Arctic Ocean? This sentence is a bit confusing.
3. Line 22 on page 17139 is a non-sentence.
4. Line 27 - is it a bit misleading to say it is highly correlated with J(Br₂)? I suspect this means it is correlated with radiation in general. If so, the presence of RGM is "indirect" evidence at best!
5. Page 17140, line 8 - should say "exhibit", rather than "cause".
6. Page 17141, line 1 - emission of what, specifically? Do you mean to suggest Br₂? You certainly don't have emission of BrO.
7. Page 17142, lines 14-18 - this is a run-on sentence.
8. Page 17142, lines 22 and 23 - again, this is by far the most important part of the overall conclusions, and should be emphasized. I believe there are recent reports in the literature about free tropospheric BrO, and these should be referenced.
9. Page 17142, end of line 24 - specify the actual range of Br- concentrations observed.
10. Page 17143, line 5 - provide a reference and/or explanation of what you mean,

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specifically, by "distillation", and by "towards Summit" line 8 - transport to Summit from where?

11. Page 17143, line 23 - I note that active halogen chemistry in the Arctic Ocean basin occurs well into May.

12. Page 17145 - Again, you might (here?) mention specifically the need for aircraft studies of transport from the Arctic basin (or elsewhere?) to Summit, with speciated Bry measurements.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 17135, 2012.

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