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Interactive comment on "Impact of reactive bromine chemistry in the troposphere" *by* R. von Glasow et al.

R. von Glasow et al.

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We want to thank both reviewers for their constructive comments on our manuscript.

Reply to Reviewer 0:

- Source strength of stratospheric bromine: We added that the stratospheric source would have to be upscaled by a factor of about 5 - 7 in order to match the mixing ratios in run "high lat" (which comes closest to the observed vertical columns of BrO).

- Discussion of sea salt aerosol: We improved our discussion of this neglected source. The main effect of not including this in our study is that the values that we present for the marine boundary layer represent lower limits to what could be expected in the atmosphere. These lower limits, however, show already the significant importance of

bromine chemistry in this atmospheric domain.

- We shortened the sentence on p. 4885.

Reply to Reviewer 1:

General comment

"model does not represent state of the art"

- Bromine from sea salt: see below under specific comments

- DMS climatology: The cited DMS climatology (Belviso et al, 2004) is based on SeaWiFS data and extrapolated to atmospheric DMS values which is not always clearly correlated to in situ measurements as noted in the abstract of that paper. However, it is not our point to judge the quality of different DMS climatologies, the point in our study was to look at relative differences with and without the reaction of DMS + BrO. Therefore a different DMS climatolgy is unlikely to affect the overall results of our study in this regard.

- Best guess scenario: we presented 4 different source scenarios because from currently available data it is not possible to tell which scenario is the "best guess" as most data on free tropospheric bromine are from high latitudes. The reason to chose 4 different scenarios was to show differences that would arise due to a latitudinally varying bromine source. The case "const" is somewhat a combination of the scenarios "high lat" and "tropics". We improved the discussion of this in the text.

Specific comments

1) Text improved according to recommendation.

2) See above.

3) The release of bromine from sea salt aerosol is indeed of great importance to halogen chemistry in the troposphere, we have looked at this process in detail in several

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previous publications. However, the main point of the present study was to investigate the effect of bromine on free tropospheric photo chemistry. As we do not (because we cannot) specify the contributions of single source mechanisms to the overall bromine source that we use, sea salt bromine can be regarded to be implicitly included.

We did include the outcomes resulting from our source scenarios for the marine boundary layer because even these low BrO mixing ratios lead to a very important change in DMS chemistry and can therefore be used as a lower limit estimation. We are currently working on inclduing sea salt aerosol in a global model, which includes the acid-catalyzed release of bromine from sea salt. This is, however, beyond the scope of the current investigation.

4) We use the heterogeneous reaction rates as calculated by Dentener and Crutzen, 1993. Their data takes vertical and humidity related changes into account, based on climatological monthly averages. We improved the explanation in the text.

5) We show the model derived vertical columns for the cases "high lat" and "tropics" in figures 4 and 5. As there is unfortunately no global data on tropospheric BrO columns available - it would have made our work a lot easier and would have enabled us to pick a "best guess" source scenario - we cannot compare our data to that. All that is available are derivations of tropospheric columns at single points, mainly at high latitudes, and these are mentioned in the text.

Technical comment: the typo is corrected.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 4877, 2004.