

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

Anonymous Referee #1

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This paper represents an interesting and worthwhile contribution to the discussion on bromine chemistry in the troposphere and reaches substantial conclusions as to the effect of bromine on tropospheric chemistry. Certainly, given that there is a lot which is unknown about tropospheric bromine sources, it is valid to study in a general sense the effects of different types of bromine sources on tropospheric chemistry. My main criticism is that the model does not represent the state of the art. Some important chemistry has been omitted (see comment 3), the DMS climatology is rather old, and none of the 4 model scenarios represent the “best guess” of bromine sources. Why did the authors not combine scenarios “high lat”, “strat”, and “tropics” (including aerosol recycling) in order to provide a scenario with all (or most) known sources taken into account? Then some other comparisons could be made, e.g. the relative contribution of organic (individual components) and inorganic bromine.

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Specific comments:

1. Pg 4880 In 1 “Another shortcut occurs in the NO_x cycle: by oxidizing NO to NO₂ without changing Σ ” This sentence is rather unwieldy. I suggest changing to “Another shortcut occurs in the NO_x cycle. Because both the BrO reactant and the NO₂ product are members of the odd oxygen (Ox) family, this cycle oxidizes NO to NO₂ without changing the sum of Ox.

2. Pg 4880 In 16. There have been other, improved, DMS global climatologies published since Kettle (1999) (see Belviso et al., 2004, for a comparison).

3. Pg 4882 In 14 and onwards. Discussion of aerosol cycling. A substantial fraction of the bromide in sea salt particle ends up in the gas phase, yet if I understand it right, the model used here only accounts for recycling of gas phase bromine on particles, not release of aerosol bromide, e.g. the reactions $\text{HOBr} + \text{Br}^- + \text{H}^+ = \text{Br}_2 + \text{H}_2\text{O}$ and $\text{BrCl} + \text{Br}^- = \text{Br}_2 + \text{Cl}^-$ and hydrolysis of existing seasalt bromide to form HOBr are not included. If these reactions are omitted then there is a missing source of bromine atoms to the gas phase.

4. How is the change of aerosol surface area/ liquid water content with height treated in the model?

5. In several places (pg 4883, In 10; pg 4886, In 13) it is stated that the “high lat” scenario yields close agreement with measured BrO data. It would strengthen the paper to back up these statements with a figure/table.

Technical comment: Pg 4890 Ln 23. Typo, “partcile”

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

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