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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The contribution of anthropogenic bromine emissions to past stratospheric ozone trends: a modelling study" *by* B.-M. Sinnhuber et al.

Anonymous Referee #3

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1 General Comments

The paper is based on rather old modelling tools for assessment of bromine impact on stratospheric ozone but it is suitable for ACP after some modification. It is now well structured and contains the 2 parts (1) transient simulations and (2) almost steady state calculations for a coefficient α to estimate the relative importance of bromine compared to chlorine introduced about 7 years ago for assessments.

2 Specific Comments

I'm surprised that for a rather cheap 2D-model such a coarse vertical resolution of 3.5km is used, that might not be necessary but is less critical than in a 3D model. Does the model include a PSC-parameterization? It should be also already mentioned in section 2 that the model neglects the 11 year solar cycle (even if it is easy to include that in a 2D-model).

The section on tropospheric washout (page 6502) needs some clarifications. It should be explicitly said that washout is switched off for the bromine species only. This leeds however to an overestimate of Bry in the lower stratosphere because Bry accumulates in the troposphere and there is almost no sink via transport at the tropopause. This means that in the lower stratosphere the relative effect of bromine and also the α is overestimated. Or was that artifact only used in the transient simulations? I doubt that when I see figure 8.

It is known since more than 20 years that ClO+BrO is most important in the midlatitude lower stratosphere (reference missing!). Is that the reason that the latitudes higher than 60^o are almost omitted in the discussion or is it due to problems with polar chemistry?

Is the model response to ΔBry really linear as stated on page 6507? The reaction ClO+BrO is linear but together with heterogeneous chemistry I would not expect linearity. The results in Figures 8 and 9 also do not support that. Critical is here the fast reaction of $BrONO_2$ on aerosol which should also have an impact on nitrogen species. Were the calculations performed exactly like in Daniel et al (1999), i.e. 7 years from 1998 conditions and using the last year? It might be also better to show the altitude distribution for α for spring and fall in both hemispheres, i.e. to include also September into Figure 8 and 9.

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3 Technical comments

In the abstract the 2 sentences in sequence containing percentages of ozone depletion should be merged and simplified.

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