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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The contribution of natural and anthropogenic very short-lived species to stratospheric bromine" *by* R. Hossaini et al.

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Response to Referee 2:
We thank Referee 2 for his/her comments. The comments are repeated below (in *italics*) and our responses are given in **bold** text.

This paper presents a well written, concise study of the natural and anthropogenic short-lived species to stratospheric bromine. It provides an interesting contribution to the current discussion concerning the role of very short-lived substances in the stratospheric Br_y budget. I recommend this paper for publication in ACP after the

following (mostly minor) issues are addressed.

Major comments: Pg 23864, line 8-10 – have you tested the implications of the simplistic assumption of surface vmr being constant with latitude and longitude? The study of Warwick et al., [2006], showed $CHBr_3$ profiles considerably different depending upon source region, what are the implications of this for the results presented here?

No and it is true that profiles of the natural source gases will exhibit variation in the atmos-phere depending on location. Certain regions have been identified as potential hot spots where emissions from the ocean may be relatively large. If coupled with a strong convective source region (e.g. tropical Western Pacific) this could lead to a larger influx of, for example, $CHBr_3$ to the TTL. We would expect the model to capture the increased upwelling in these regions but as you point out the surface vmr will be prescribed as being constant. We feel that the magnitude and distribution of emission fluxes for these gases, at this stage, are still poorly quantified. Therefore, use of such would add additional uncertainty to the model calculations. While use of surface fluxes is possible for $CHBr_3$, we can't do it for most of the minor species and we want to do a simple, consistent scheme in the first instance. Our simpler approach made here provides reasonable agreement between modelled and observed profiles in tropical regions. Addition of VSLS emissions to the CTM will be explored in the near future and we will add further text to the revised manuscript explaining our approach and any limitations.

Minor comments: Pg 23867, line 5 on, please state the initial concentration for the idealized tracer, and in a related point it may be valuable to express Figure 4 in terms of % or rather parts per 1000 (I am assuming here the initial tracer concentration or surface concentration is 1 pptv).

Yes, the imposed mixing ratio was 1 pptv at the surface. We will show Figure 4 in terms of % in the revised manuscript.

Pg 23867, line 26 Note here that the equivalent lifetime plots of $CHBr_3$ and CH_2Br_2 can be found in Hossaini 2010.

Ok, we will add this.

Pg 23868, discussion of table 2 – table 2 presents a very nice presentation of data and especially useful will be the percentages of BL concentrations that reach the stratosphere. While beyond the scope of this (bromine focused) paper, could you please quote the numbers for CH_3I and/or i6hr expected as a % of BL concentrations for entering the stratosphere? Since these have very short lifetimes, perhaps equal to some of the new anthropogenic bromine species (but with higher BL concentrations), this could be worked into the text at this point.

Yes, we will include these numbers in the revised manuscript text.

Technical corrections: Pg 23864, line 23 – yr – years Pg 23870, line 12 – 'a low bias' this should be 'a high bias' ?

Ok, yr is changed to years.

Perhaps this is not clear. Accounting for the small amount of Br_y lost in the troposphere due to CH_3Br degradation will decrease the contribution (slightly) of CH_3Br to the total bromine observed in the stratosphere. Although minor, this means estimates of Br_y^{VSLS} may be underestimated, i.e. a larger VSLS source is needed.

References

Warwick, N. J., J. A. Pyle, G. D. Carver, X. Yang, N. H. Savage, F. M. O'Connor, and R. A. Cox (2006), Global modeling of biogenic bromocarbons, Journal of Geophysical Research-Atmospheres, 111(D24305), D24305, doi: 24310.21029/22006jd007264.

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