Atmos. Chem. Phys. Discuss., 10, C12666–C12670, 2011
www.atmos-chem-phys-discuss.net/10/C12666/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sensitivity of stratospheric Br_y to uncertainties in very short lived substance emissions and atmospheric transport" *by* R. Schofield et al.

R. Schofield et al.

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Received and published: 21 January 2011

We thank the reviewer for improving our manuscript with their careful review. We have included the original review text here as bold text, and our responses we provide as normal text below.

This paper evaluates the sensitivity of Br_y entering the stratosphere from short lived source gases emitted in the boundary layer with a simplified conceptual model based on backward trajectory calculations. The model includes parameters that allow to study the sensitivity of bromine delivery to convection and washout as well as source strength and transport characteristic time scales.

The approach is sound and interesting and the paper is clear and overall well written, although a style correction can make reading easier. I do not have any major criticism, hence I recommend its publication in ACP after some mainly minor corrections listed below.

Specific comments and technical corrections:

Abstract: about the interpretation of the results, is it the case that 2 ppt is a slight change but 2.9 is significant?

Thank you, this was an error and has been corrected.

The introduction is rather succinct, and it could be helpful to include some more of the motivation/rationale of the study, the importance of bromine in stratospheric chemistry, etc.

We have included two sentences to introduce stratospheric bromine.

P24174 l22: The definition of X^{SG} could be made more explicit.

We now do this.

P24175 l19: Doesn't read well: 'how many' > 'the number of'?

This has been changed.

P24176 l24: "is replaced by air with characteristics of the convective detrainment" doesn't read well: maybe replace with "is replaced with air from the convective detrainment".

This has been changed.

P24177 l3: Include a more explicit definition of d_C

We now include the definition from ECMWF for d_C explicitly – thank you, this was a point brought up by all reviewers and this was the best way of resolving this issue.

l18: borne > kept?

This has been done.

P24179 l17: Include a space after :

This has been changed.

l20: i.e. > e.g.

This has been changed.

P24180 Eq (4): Define more clearly α_i.

We include a fuller definition of α early in the alpha section.

P24183: The year 2000 is mentioned in line 19, it may be better to mention it before, in line 11 by example.

This has been changed.

l19: "cluster" may be confusing, maybe use "sit" or "aggregate"?

This has been changed.

l23: Include a parenthesis after "(Fig.6".

Thank you.

P 24184 l7: "CPTs are limited between 20N and 20S irrespective of season": do you mean that CPT crossings are only found between 20N and 20S?

Yes, the wording has been altered accordingly to avoid confusion here.

l23: Does FT stand for free troposphere?

Yes, this has been written out in full here, although FT was defined earlier, it is far away from the definition and the frequency of FT use is not high enough to remind the reader.

P 24185 l9: Explicit where CH_3Br is more abundant and respect to what.

CH_3Br is more abundant than the other SLS in the 'background' UT or Land emission scenarios. The wording has been altered.

C10917 l23: complexer?

Thank you.

P 24186 l11: most short-lived > shortest lived?

Thank you.

l12: What is the main verb of this phrase?

The sentence has been reworked.

P 24187 l13: Do you mean that a larger chemical lifetime implies less concentration at the top of the TTL?

Thank you for pointing out this error - of course this cannot be the case. It happened that the longer-lived substance run resulted in less Br_y but this was due to the reduction of CH_2Br_2 and $CHBr_3$ and not the longer lifetime of CH_3Br.

P 24187 l7: It may be worth to underline the dependence on the description of the convection in the analysed meteorological fields.

A new conclusion item has been added.

Fig 1, caption: subjected to convective injection?

The wording has been altered.

Fig 6: You could add a circle or some kind of mark to point more clearly to the interesting feature of the graph.

The darkest red points indicating the longest residence times since the last convective event are clear to see without placing a mark or box around them (left panels). On the

right the markers make the plots already quite busy so we did not alter this figure.

Fig 8 caption: megneta > magenta.

This has been changed.

"The dashed line provides the Halons+CH_3Br contribution": where is this information coming from?

From WMO report - this information has been included in caption now.

Fig 9 caption: Make explicit if the average include all years and the source for Halons + CH_3Br contribution in the last phrase. Include a more precise definition of the convective efficiency to make the figure self explanatory.

Thank you for these recommended changes, they have been implemented.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 24171, 2010.