

***Interactive comment on “What do we learn on bromoform transport and chemistry in deep convection from fine scale modelling?” by V. Marécal et al.***

**Anonymous Referee #1**

Received and published: 6 January 2012

**Review of: What do we learn on bromoform transport and chemistry in deep convection from fine scale modelling?**

**Marécal et al. (2011)**

**General Comments**

Marécal et al. (2011) is an interesting process study. The authors attempt to model the transport and chemistry of bromoform ( $\text{CHBr}_3$ ) and also its organic/inorganic product gases (PGs) in both a convective cloud and a stable atmosphere. The authors find that following their idealised convective event, a significant amount of both organic and

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inorganic PGs have been lifted to the upper TTL. The authors examine the detailed processes controlling the relative yields of various PGs and their vertical ascent throughout a convective column. Clearly the topic of this paper is of scientific interest and there are some useful results here. However, some of the conclusions are based on a compilation of highly uncertain factors. Nevertheless, the authors discuss the uncertainties in the work and the results do contribute to the present understanding of VLS transport/chemistry on the cloud scale. Therefore, I recommend publication in ACP after addressing some comments below.

I must also add that in my view this paper is poorly written in terms of structure and language. This makes following the science somewhat difficult. I feel the manuscript would greatly benefit from, in fact it probably needs, a good proof read from a native English speaker before publication in ACP. I suggest some technical corrections below but there are more than I care to list.

**Specific Comments**

The results here depend critically on the Henry's law constants for most of the species considered. For the organic PGs, these are taken from a soon to be submitted paper, Krystofiak et al. (2011). How much confidence do we have in the calculated values for the key organic PGs using either BCM/MCI? Can we determine how sensitive the conclusions of this paper are to the uncertainties in the Henry's law constants?

Although photolysis is the dominant loss for  $\text{CHBr}_3$ , how good is the model OH field? Has it been compared with any observations? The modelled  $\text{CHBr}_3$  lifetime of 9 days seems on the low side.

Could the authors please further comment on the use of 40 ppt for  $\text{CHBr}_3$  initialisation? Is this a typical abundance in the tropics and close to sources? Or is this more like an extreme upper limit for the idealised study? Please mention in the text.

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It would be good to see vertical profiles of **all** the model Br<sub>y</sub> species in the the cloud domain. How does the partitioning of Br<sub>y</sub> compare to previous model work? For example, Aschmann et al. 2011. Also, how does the partitioning of organic product gases compare with Hossaini et al. (2010)? Are they in qualitative agreement? Although I appreciate a direct comparison is not fully appropriate here.

#### Technical Corrections

Use either '**very short-lived species**' or '**very short-lived substances**' but be consistent. Both of these are used - in the 1st line of the abstract and the 1st line of the introduction. The latter is used in the most recent WMO ozone assessment and so this should probably be used. Also, 'VSLs' is used in numerous places. Just use 'VSLs' – no need for the 's' on the end.

#### Abstract

Line 1: Remove 'sources of'

Line 2: 'degradated' —> 'degraded'

Line 2: 'halogen' —> 'bromine'

Line 5: 'is mainly the transport' —> 'is mainly due to transport'

Line 6: 'in the low stratosphere' —> 'into the lower stratosphere'

Line 19: 'transport of the bromoform' —> 'transport of bromoform'

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Line 8: Define pptv

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Lines 1-3: In the abstract you use '3-D' so why do you now use '1-dimensional' and '3-dimensional'? Later on this page you go back to '3-D'. Please be consistent and define in the first instance.

Line 9: Cite WMO reports like normal, for example, (WMO, 2007). Remove the word 'report'. Also, better to cite the individual chapters when possible. Here it would be better to cite chapter 2 directly - Law and Sturges et al. (2007).

Line 18: Hossaini et al. (2012) examine convection in more detail than their 2010 paper. Cite their 2012 paper here also.

Line 26: Has 'Br<sub>y</sub>' been defined yet?

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Line 23: 'tropical tropopause layer' —> 'TTL'

#### Page 29568

Line 11: Have 'Cl<sub>y</sub>' and 'NMHC' been defined?

Line 11: Reword sentence beginning 'For Cl<sub>y</sub>...'

Line 22: 'gaseous rate constants cross-sections' —> 'gaseous rate constants

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and cross-sections'

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Line 5: 'Bry' —> Br<sub>y</sub>'

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Line 15: Photolysis rates?

Line 18: 'Since this is the number' —> 'Since it is the number'

Please use legends on Figures 1 and 2.

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 29561, 2011.

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