

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

### **Anonymous Referee #1**

Received and published: 7 September 2011

This concise, well-structured, and well-written paper presents a global three-dimensional chemical transport modelling study on the impact and contribution of 9 very short-lived species (VSLS) on the bromine budget of the stratosphere. In addition to major VSLS like  $\text{CHBr}_3$  and  $\text{CH}_2\text{Br}_2$ , poorly studied anthropogenic VSLS like  $\text{C}_2\text{H}_5\text{Br}$ ,  $\text{CH}_2\text{BrCH}_2\text{Br}$ ,  $n\text{-C}_3\text{H}_7\text{Br}$ , and  $i\text{-C}_3\text{H}_7\text{Br}$  have been also considered. Modelled tropical profiles of long-lived sources gases and a range of VSLS have been compared to the 2009 NSF HIPPO-1 aircraft campaign and ongoing NOAA measurement programs data and a reasonably good agreement is obtained. The modelled contribution of the VSLS to the stratospheric  $\text{Bry}$  is found to be in the 4.9-5.2 range, in agreement with balloon DOAS observations. This study is a valuable contribution to the atmo-

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spheric bromine issue which is a timely subject matter. Therefore I recommend the paper for publication in ACP after addressing the following comments:

Specific comments:

Page 23861, line 28: Are nPB and iPB widely used and for which purpose ? Please mention it.

Page 23862, lines 13-14: In addition to references, a short description of the HIPPO-1 campaign and NOAA VSLS measurement programs is needed. That could help the readers who are not familiar with these data sets.

Page 23864, line 15: The evaluation no 15 of the JPL compilation is used for rate constants and absorption cross sections but a new evaluation (no 17) has been recently released. Are there major changes between evaluations 15 and 17 which can have an impact on your modelling study ?

Page 23867, lines 18-20: The choice of convection scheme is important for this kind of study. Do you expect a significantly different contribution of the VSLS to stratospheric  $\text{Bry}$  if another parameterisation of cumulus convection was used in SLIMCAT ?

Page 23868, lines 5-6:  $\text{C}_2\text{H}_5\text{Br}$  and EDB are minor VSLS but due to their long lifetime in the TTL, they are potentially important bromine carriers to the stratosphere. Do we expect an increase of these anthropogenic VSLS in the future ?

Page 23869, lines 23-25: The modelled total  $\text{Bry}/\text{VSLS}$  supply is of 4.9-5.2 ppt, which is consistent with the Dorf et al (2008)'s estimate inferred from balloon DOAS observations of  $\text{BrO}$ . It should be noted that this supply of 4.9-5.2 ppt is somewhat larger than the values derived from balloon and aircraft measurements of the source gases in the TTL (0.7-3.4 ppt; WMO, 2010). Please comment this point.

Page 23870, lines 13-14: Results are sensitive to the model OH field. Has this field been assessed through comparison to observations ?

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Technical comments:

Page 23863, lines 20-22: The reference to Table 1 is not clear. You could replace the sentence by "In this study we include 9 bromine-containing VLSL SG tracers (see Table 1) and the following long-lived species: methyl bromide ...".

Figs 1 and 2: It is sometimes difficult to distinguish the Sdiagnosed (black line) and Sarchived (dark blue line) curves. The use of a lighter color for Sarchived would help.

Fig 2: Please also indicate the TTL with dashed lines as in other plots.

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 23859, 2011.

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