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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modeling the transport of very short-lived substances into the tropical upper troposphere and lower stratosphere" *by* J. Aschmann et al.

Anonymous Referee #2

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In this article the authors investigate the transport of CH_3I and $CHBr_3$ into the tropical upper troposphere and the lower stratosphere by using an isentropic CTM. They extended the model by a parameterisation for convective transport which is usually missing within isentropic models. In a first step this approach is evaluated by comparison of modeled CH_3I and $CHBr_3$ profiles with measurements from the AVE fight campaign, by comparison of modeled ozone to SHADOZ measurements and by comparison of modeled H_2O to HALOE measurements. The model is shown to capture the main characteristics. In a second step the authors investigate the effect of dehydration on the soluble bromine gases resulting from $CHBr_3$ photolysis and subsequent decomposition. They derive minimum and maximum thresholds for the contribution of $CHBr_3$

decomposition to Br_y of 1.6 and 3 ppt, respectively. The results are topped of by an investigation of different source region where it is shown, that the West Pacific is the most effective region for transport into the stratosphere.

The paper is well structured and presents interesting results. I recommend the publication after some revisions:

1.) The authors claim in the title of the article to investigate the transport of very short-lived substances, but they refine themselves to two species, namely CH_3I and $CHBr_3$. I would recomment either to change the title from "very short-lived substances" to "CH_3I and $CHBr_3$ " or to add some concluding remarks in the discussion session about what the results of this study imply for the other very short-lived substances and for the total amount of bromine in the stratosphere.

2.) The authors often refer to a "ground level source of 1 ppt" (e.g. p18514 l.23). But, I expect a source to have a unit including the information "per time interval". I suspect you simply assume the mixing ratios at the ground level to be 1 ppt all the time. Can you be more precise?

3.) p. 18517, ll. 2-3: It is not clear to me if instantaneous or 6 hourly averaged updraft convective mass fluxes are used. It would be desirable to get an estimate about the error this includes. (A strong short-lived convective cell might have an unrealistic impact, is this unimportant in the statistical mean? By using 6 hourly instantaneous data I would expect to overemphasize certain regions where convection is usually high at this time of the day. By using averaged data I would assume that the averaged updraft convective mass fluxes are not strong enough.)

4.) Section 3.1.2:

a) Only the comparison to two SHADOZ stations is shown here. I think the comparison to the other SHADOZ stations is also important. The authors give no reasons for their choice of the two stations. I suggest to provide the pictures of the comparison to the

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other SHADOZ stations within an electronical supplement.

b) The authors state that the model contains a linearized ozone mechanisms. A discussion of the errors implied by this simplification would be useful to correctly classify the results of the comparison.

5.) p.18523 ll. 4-8:

It took me some repeated rereading of this sentence to understand, what the authors wanted to say. I understood, that 1.2-1.3 ppt of the 1.6 ppt Br_y above the cold point are formed above the cold point, i.e. the insoluble $CHBr_3$ was able to crossed the cold point whereas the soluble Br_y would have been dehydrated during the vertical transport. Did I understand correctly? The sentence should be rephrased to be easier understood.

6.) Section 3.3

Even if the focal point of this study is the tropical region it would be interesting to see the relative contribution of different source regions to other region, e.g., what are the contributions to the midlatitudes or even the polar region? Is there are dominant source region for Africa, North America etc.? I know this is beside the point of this paper nevertheless it would be interesting. Maybe the authors could provide them within an electronic supplement.

Typos etc.:

a) Fig. 2; Fig. 7;

change “were also temporally averaged..” to “are temporally averaged..”

b) Fig.5:

Caption: There is no explanation for the 0.3 ppt and the 0.75 ppt in legend. Line 5 of figure caption: Do you really mean “also” I would have expected “only”.

c) Fig. 8

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“Modeled distribution of tropical averaged water vapor mixing ratio from 2000 to 2005.” change to “Modeled distribution of tropical water vapor mixing ratio temporally averaged from 2000 to 2005.”

d) Fig.9 / Fig. 11

chage caption according to c)

e) Fig. 14 / Fig. 15

change “source regions to total amount” to “source regions to the total amount”

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 18511, 2009.