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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Fractional release factors of long-lived halogenated organic compounds in the tropical stratosphere" *by* J. C. Laube et al.

**Anonymous Referee #2**

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## 1 General comments

Laube et al. present a new data set of 15 long-lived halcarbons for the tropical stratosphere. This data set is unique in its completeness and by itself worth for publication. The authors enhance the value of the data set by deriving fractional release factors as a function of mean age which minimies in a first order sense effects resulting from the specific measurement location and date. Therefore this data set will be welcomed by modellers when validating their models.

Nevertheless, there some limitations of the study which should be discussed in more details by the authors. The authors point out that FRFs deduced so far haven't included observations from the tropics, and that here the widely used FRFs cannot be



used according their observations. But the data which are used to deduce the new tropical FRF(mean age) functions originate essentially just from two tropical balloon flights taken 17 days apart and at the same location, as the Geophysica don't reach into the tropical stratosphere. At least one would expect the QBO phase to influence the result and the authors should therefore discuss how representative the data set is or how strong for example QBO could modulate the functions.

The method applied for calculating FRFs is not fully described in the current paper. The reader has to refer to the literature in order to compare the method used here with methods used by other authors. Perhaps this part could be given more attention by the authors in a revised version.

## 2 Specific comments

| Page | Line | Item | Comment |
|---|---|---|---|
| 20284 | 11 | imprecise | imprecise could be understood as following from instrumental errors etc. |
| | 9ff | Moreover ... | These statements are too strong in my opinion. ODP and FRFs are used typically as an approximate representation of ozone photochemistry. |
| | 15 | enhance | it's not the halocarbon itself which take part in catalytic cycles |
| | 15 | paragraph | The argument is too general. The paragraph can be combined with the following one and formulated in a more concise way. |
| | 21 | very few, ff. | This is not true when taking into account the great number of satellite observations by HALOE, MIPAS, CRISTA etc.. Even the number of different CFCs observed by the satellites is not really small. The special advantage of the in-situ WAS observations (much more completeness, high precision, vertical resolution) should be pointed out, but in view of their limited coverage in space and time. |



| Page | Line | Item | Comment |
|---|---|---|---|
| 20285 | 6ff | paragraph | the equation and definition should be given first. The FRFs should be put in the context of ODP and GWP estimation here, see first paragraph on page 20287. |
| 20287 | 9 | These FRFs ... | Please specify how this can be accomplished |
| | 12 | parameterization | what do you mean by parameterization of CTMs, and how can CTMs predict future ozone?? |
| 20288 | 12 | The whole air | do you mean „all“ samples from both platforms? |
| | 18 | procedure | Can you specify the differences to Schauffler and how this could influence the results? The cited references give the impression that Engel et al. is not the whole story. As I understand you apply the age spectrum according Engel et al. and the entry mixing ratios according Laube. Perhaps a simple formula would help to clarify. |
| | 18 | analysis | Age spectra as derived by empirical studies or by model studies may include some contribution stemming not from irreversible mixing processes but from averaging over air masses of different characteristic. In your sample the tropical balloon flights are the ones where the difference between tropics and mid latitudes is most pronounced (as expected). One may ask how representative these two data sets for the tropical stratosphere are on a global scale. |

| Page | Line | Item | Comment |
|---|---|---|---|
| | 22 | SF6 analysis | could/should be part of the section analysis. What about the error of mean age? Is it assumed to be zero and therefore no error bar is shown for mean age in the figures? Does the fitting procedure include the error of mean age? |
| 20290 | 6ff | error analysis | Could you give some idea what the main contributions to the errors are? |
| | 16 | But transport ... | The different correlations are caused by the different photochemical „dose“ air parcels experience on different paths through the stratosphere even having the same transit time. Just the existence of transport barriers or the fact that air parcels experience chemistry is not sufficient to explain the differences. |
| | 23 | The correlation | What about the QBO? Schoeberl et al., JGR 2008, have analysed QBO amplitude for various substances. As for N2O, also for the shorter lived CFCs QBO would influence transport and to some extent the correlation. The data set presented spans only a small part of the qbo cycle and could therefore include some systematic deviation. |
| 20291 | 26 | polynomials | First, it would be helpful to state also in the text, and not just in the table caption, that the fit functions were derived using data between 22s and 22N only. Second, it is worth to mention (and to explain) that through the fit procedure negative and meaningless FRFs are produced. |



| Page | Line | Item | Comment |
|---|---|---|---|
| 20292 | 4 | agreement | Inspecting the correlations, data of the Geophysica flights at mean age > 1.5 a obviously are not belonging to the tropical domain. It may be better to leave these data completely out for constructing the correlations. |

## 3 Technical corrections

| Page | Line | Item | Change To/ Comment |
|---|---|---|---|
| 20284 | 3 | influence | go into |
| | 6 | measurements on | measurements of |
| | 7 | transit times | transit time etc. |
| | 10 | revealed | reveal |
| | 17 | radiative balance | radiative balance depends on |
| 20285 | 18 | could be | are |
| | 10 | reference | should be given to Solomon and Albritton here too. |
| 20286 | 10 | probability distribution function | probability density function |
| | 21 | distribution | concentration ..... as a function of time |
| 20287 | 3ff | measures | indices |
| 20288 | 1 | volume | volume each |
| | 12 | Frankfurt | specify lab or say within your group |
| 20294 | 13 | correlation | you derive FRF(mean age) from correlations |
| 20301 | H-2402 | error = 0.00 | correct? |
| Fig. 4 | caption | | as in Fig. 5+6 start with F113 |

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 20283, 2009.