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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.

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General author response

The contribution of the referee to the improvement of the manuscript is very much appreciated. Replies to the specific comments can be found below.

Referee comments

The authors should be consistent in the use of CFC and HCFC rather than F, e.g. CFC 11 instead of F11 and HCFC 22 instead of F22.

p. 20292, line 15, This sentence was a bit confusing. The authors should consider the following: : :"Therefore the derived tropical correlation functions of FRFs vs mean age

can be used for a wider temporal range than mixing ratio correlation functions and are valid: : :

Author response

Changes were applied as requested.

Referee comment

Introduction: p. 20285, line 7, FRF represents the inorganic halogen fraction released assuming that the difference between the entry mixing ratio and measured mixing ratio is all in the inorganic form. This is generally assumed but it would be good to state it.

Author response

The requested statement was added ("Please note, that our calculations include the assumption that the difference between the entry mixing ratio and measured mixing ratio is all in the inorganic form.").

Referee comment

p. 20289, line 12-13, listing the source of information in the Tables after the references was somewhat confusing. The authors should consider including the source with the reference, e.g. Table 1-1 of Montzka and Fraser, 2003 (AGAGE, in situ data: : :), and Table 1-2 of Clerbaux and Cunnold: : :

Author response

Changes were not applied as this would not comply with the Copernicus Publications Reference Type recommendations.

Referee comment

Calculation of fractional release factors and error bars: Given that the formulas for calculating FRFs are not widely used in the community, it would be helpful to include the formulas that were used by the authors.

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Author response

A passage was added for clarification: “We calculated FRFs using Eq. (1). The unknown quantity in this equation was . Here, a procedure similar to those of Schauffler et al. (2003) and Newman et al. (2006) was used to derive it.” The simple formula for the parameterisation of the age spectrum was added to the text (“As the corresponding age spectra cannot be measured directly they were derived from the mean ages via a parameterisation according to Engel et al. (2002) using 0.7 as a fixed ratio of the squared spectral width to the mean age.”). The other formula (i.e. the calculation of corrected stratospheric entry mixing ratios) is not novel and can be found in this reference.

Referee comment

p. 20290, line 7, what does “sample instability errors” mean?

Author response

More details and a reference were added for explanation (“only for CCl4 and CH3CCl3 on flight B42, see Laube et al., 2008 for further details”)

Referee comment

Results and Discussion: p. 20291, lines 5-7, I don’t understand this sentence, e. g. air masses that have experienced similar transport pathways show different correlations. It’s certainly true that the correlations are different for different latitudes in the stratosphere, but the transport pathways are not the same.

Author response

This is exactly the message of the sentence (same latitudinal region leads to similar correlations).

Referee comment

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p. 20291, lines 15-24, The point should be made in this section that the vertical distribution of loss for each compound whose loss is primarily by absorption of radiation varies with latitude, e.g. loss rates in the tropics are larger at a given altitude than at mid latitudes because of the enhanced radiation. For gases with primarily an OH loss, e.g. HCFC 22, the vertical distribution of loss is less variable with latitude because the distribution of OH is less variable.

Author response

The following was added to the section as additional explanation: "The primary sink of HCFC-22 is the reaction with OH. The more uniform distribution of OH in the stratosphere then leads to a less variable vertical distribution of loss as compared to compounds with loss primarily due to absorption of radiation. Little variability with latitude can also be observed for compounds with very long stratospheric lifetimes in general (e.g. CFC-114, see Figure 3) because the differences in photochemical loss are smaller than the measurement and calculation uncertainties."

Referee comment

p. 20293, lines 4-8, The difference for CFC 114 between this work and Schauffler et al, 2003 is interesting, especially given the similarities for the other gases. It is something that requires further work to determine the cause.

Author response

Another statement was added: "But it is notable that the respective correlation of FRFs and mean ages derived by Newman et al. (2006) agrees much better with our tropical data (see Figure 3)."

Referee comment

Table 1 caption, what criteria were used to assign samples as "uncontaminated" samples?

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Author response

The requested explanation was added to the analytical section (“Some of these samples showed contaminations most probably caused by a temporal malfunction of the pump used to evacuate the containers. Those samples showing contaminations in two or more long-lived halocarbons were not used for further retrievals.”).

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

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Interactive Comment