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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric histories and growth trends of C_4F_{10}, C_5F_{12}, C_6F_{14}, C_7F_{16} and C_8F_{18}" *by* D. J. Ivy et al.

Anonymous Referee #2

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This is a good paper reporting on a nice piece of work describing new atmospheric measurements of a number of perfluorinated carbon compounds. A good deal of the paper is appropriately dedicated to describing the details of these new measurements, however number of details could be improved and are described in the review below. There are also some minor points made in the results and discussion that don't appear to be supported by the data presented. I also find it surprising that rough estimates of global emissions aren't presented, especially since some of the discussion is dedicated to interpreting what the data suggest about emissions and how they have changed in the past. It would seem worthwhile to ask the authors why this information will appear only in a separate paper.

On the abstract: Line 15,16,it seems quite unusual to report an average rate of increase

over a 30+ yr period when that rate has changed substantially over time. . .

Line 15 of abstract and line 19 of conclusion. The contribution of these PFCs is estimated to be 0.35 mW/m2, and this is stated as being 3.6% of the total from all PFCs. This percentage seems too small considering the contributions of other PFCs shown in Figure 1-24 of Chapter 1 of the recent WMO ozone assessment and the fact that these other PFC contributions haven't increased all that rapidly in recent years.

Last sentence of the abstract is unusual; it is not at all clear on what is being verified and why it is necessary.

On the main text and conclusion: p. 4172, line 21, could be clearer: is it true that the four archive samples that were also apparently contaminated were not sampled/stored in Al cylinders? Were they also stored in electropolished SS tanks?

p. 4173, line 10, 0.015 and 0.011 ppt for these two PFCs are below the detection limits reported in Table 2, hence it is unclear why the discussion is different for the C6 and C7 PFCs, where the paragraph starts off with the statement that these chemicals "are not detectable..."

p. 4173, line 16 and 17 and p. 4174, line 5. How is it that we know that the emissions of the C4 and C5 PFCs are primarily from the NH (a citation needs adding, or some short argument considering the uses needs to be made)?

p. 4173, line 19. Higher variability is not apparent in NH archive results, despite the assertion in the text. Residuals to the smoothed fits actually look like they could be larger in the SH record for some gases.

p. 4173, line 23 (also in abstract and discussion of radiative forcing), the term "globally averaged background tropospheric mole fraction" does not seem appropriate, given that this metric is derived from samples at two sites only. Some caveats need mentioning. . .and more accurate descriptions supplied. I imagine that the mean of the results from these two sites could provide a reasonable estimate of the globally aver-

ACPD

12, C894–C896, 2012

aged background mole fraction, but some discussion is warranted to ensure the reader understands that this is an extrapolation.

p. 4174, lines 5 through 10, it doesn't seem likely that reduced mixing ratios for a trace gas arise from sampling non-background conditions...

p. 4174, lines 25 through 27, why not include these growth rates in Table 3?

p. 4176, lines 1 through 5. Citations are needed that describe the efforts of industry to reduce emission. Also would be good to understand the relative emissive contributions of concerted use of these PFCs (ODS replacements) relative to unintended releases as a result of industrial manufacturing (Al production).

Terms that could be better defined: Optimized emissions First-in-kind emission

Items that would be more informative if quoted more quantitatively: p. 4169, line 4, "a small blank", about how large? line 21, I presume the diluent air was checked for PFC contaminant levels? p. 4170, line 13-14, what was the magnitude of this non-linearity parameter throughout the measurement range?

Table 2: define "standard precisions", is this the mean (median, 90%tile, ...) precision of repeat injections of a real air sample at ambient mole fractions, or a representation of the consistency in the prepared standards, or something else?

Table 3: I'm not convinced that the mean concentrations and growth rates during the period 1973-2011 are informative metrics to present to readers (see also my comment on the abstract). Certainly the 2011 metrics and rates for changes over recent years are informative and useful.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 4165, 2012.