

Interactive comment on “Global emission estimates and radiative impact of

C₄F₁₀, C₅F₁₂, C₆F₁₄, C₇F₁₆ and C₈F₁₈” by *D. J. Ivy et al.*

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We would like to thank the anonymous referee for their helpful and thorough comments. We have listed the referee’s comments in italics and then written a response below each one. We’ve additionally included text from the paper when it has been changed based on a comment.

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Referee 2: “This paper reports the results from an inverse method analysis of a comprehensive series of measurements of the atmospheric concentrations of C4F10, C5F10, C6F14, C7F16, and C8F18 over the time period 1973 to 2011. Annual global emission estimates for these species are inferred from 1980 to 2010. In addition to the emissions estimates, IR spectra are reported for C7F16 and C8F18 and radiative efficiencies and GWPs for these compounds are estimated. My comments are:”

Referee 2: “The scientific analysis is of the highest quality and the results are very important in terms of both atmospheric science and environmental policy.”

Author Response: Thank you for the thoughtful comment.

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Referee 2: “I am surprised that the good news from the work that the atmospheric emissions of C4F10, C5F10, C6F14, C7F16, and C8F18 have decreased substantially from their peaks in the late 1990s is largely hidden within the body of the paper. This is a significant finding and should be highlighted more clearly in the abstract. From the data in Table 3, the combined emissions of C4F10, C5F10, C6F14, C7F16, and C8F18 have decreased from 2704 to 837 tonnes yr⁻¹ from 1997 to 2010. This is a very large reduction and it seems odd that this is not mentioned and discussed more explicitly in the abstract.”

Author Response: I have added a statement about this to the abstract; “Using the 100-yr time horizon GWPs, the total radiative impact of the high molecular weight perfluorocarbons emissions

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were estimated; we find the high molecular weight PFCs peak contribution was in 1997 at 24 000 Gg of carbon dioxide (CO₂) equivalents and has decreased by a factor of three to 7300 Gg of CO₂ equivalents in 2010.”

Referee 2: “The statement in the abstract that the EDGAR database underestimated the emissions of C₅F₁₂ by more than 3 orders of magnitude should be qualified to make it clear to the reader the very small quantities involved (9.6 kg global annual emissions in 2008 in EDGAR database, 67+/-53 tonnes from Table 3 of Ivy et al.).”

Author Response: We have added a comment to the abstract; “The atmospheric measurement based emission estimates are 20 times larger than EDGARv4.2 for C₄F₁₀ and over three orders of magnitude larger for C₅F₁₂ (with 2008 EDGARv4.2

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estimates for C₅F₁₂ at 9.6 kg yr⁻¹, as compared to 67±53 t yr⁻¹ as derived in this study).”

Referee 2: “The radiative forcing impact of PFCs mentioned in the abstract should be placed into perspective with the radiative forcing from other long lived greenhouse gases such as CO₂, CH₄, N₂O and the CFCs which on an annual emissions basis is several orders of magnitude greater. My point is not that the radiative forcing effect of PFCs is negligible but that it needs to be placed in context with that from the principal greenhouse gases.”

Author Response: I have added some comparisons to other gases to the abstract and the results section; “This 2010 high molecular weight PFCs emissions are comparable to: 0.02 % of the total CO₂ emissions, 0.81 % of the total

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hydrofluorocarbon emissions, or 1.07 % of the total chlorofluorocarbon emissions projected for 2010 (Velders et al. (2009)).”

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 12987, 2012.

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C5649