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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Long-term tropospheric trend of octafluorocyclobutane (c-C_4F_8 or $PFC-318$)" *by* D. E. Oram *et al.*

Anonymous Referee #1

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This manuscript describes the determination of a long term atmospheric record for octafluorocyclobutane, (c-C4F8) using flask samples collected at the Cape Grim observatory in Tasmania between 1978 and 2008 and more recent aircraft sampling programs using the CARIBIC and Geophysica aircraft. This compound is an

important anthropogenic compound to measure due to it's long atmospheric lifetime and high GWP. The author attempts to use the Cape Grim data and a 2D chemical transport model to derive global emissions.

P 19090, Line 11, I do not feel that the origins of this compound are unclear. It is widely reported that this anthropogenically released compound is used as a chamber cleaning gas in PECVD chambers, in the semi-conductor industry for di-electric etching and with a host of other minor usages. What is unclear from this paper is why the bottom up emission estimates are so different to the estimates determined from atmospheric observations.

P 19091, Line 26, the citation for Ravishankara et al., 1993 is missing from the references

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P19094, Line 10, Can the author provide some statistics or at least describe how the magnesium perchlorate trap was shown to have no effect on the concentration data?

P19094, Line 29, Although the agreement was within 3% with no significant bias for comparison data between 1999 and 2005, it is possible that agreement between methods (and bias) might be more pronounced for earlier flask analysis. For flasks collected between 1978 and 1998, the atmospheric abundance of c-C4F8 was appreciably lower, and analysis was carried out using a lower sample volume (post 2006 sample volume is 50% higher).

P19094, Line 5-9, Does the UEA scale have a name and a reference year, this would aid future comparisons of data from other groups who might measure c-C4F8?

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P19094, Line 28, Can the author describe how a figure of 7% uncertainty is determined for the UEA calibration scale?

P19095, Line 2-5, What were the errors that caused the old UEA scale for c-C4F8 to produce atmospheric measurement mixing ratios 19.6% higher than the newer scale, this appears to be a very large difference.

P19096, Line 14-19, You calculate growth rate for 2003-2008 by using a linear fit and then compare this to the growth rate between 1990-2002. What type of fit is used for the 1990-2002 period? Why choose to compare this period with 2003-2008, when you also state that during the early 1990s growth slowed then increased again since 1996?

P19097, Line 7, Synoptic variation, short timescale dynamics, stratospheric-tropospheric exchange

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and interhemispheric transport and interannual variability will all effect data acquired at the Cape Grim site. How are these effects dealt with by the 2D global chemistry transport model employed to analyse the data, especially since no physical measurements are made in the northern hemisphere at the same time as the Cape Grim measurements?

P19097, Line 11-13, what evidence is there that he industrial usage of c-C4F8 result in 95% of emissions in the Northern Hemisphere? Is it not possible that the function of industrial activity has changed since Reeves et al., 2005? P19097, Line 21, Can you provide a reference for the 1yr inter-hemispheric mixing, many studies have used longer times than this, how sensitive is your analysis to changes inter-hemisperic mixing?

P19100, Line 23-25, The CARIBIC flight data for the

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Southern Hemisphere mean produce values growth values that are higher and outside of the uncertainty estimates that are indicated by the Cape Grim record. The reported Cape Grim mid-2008 mixing ratio was reported as 1.1ppt with a linear growth rate of 0.03 ppt/yr, this would produce a mid-2009 value of 1.13ppt and mid-2010 value of 1.16ppt, the CARIBIC flight produced values in 2009 of 1.18±0.02ppt and 2010 values of 1.20±0.01ppt. This would suggest a linear growth rate of ∼0.04-0.05 ppt/yr?

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 19089, 2011.