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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global emissions of HFC-143a (CH_3CF_3) and HFC-32 (CH_2F_2) from in situ and air archive atmospheric observations" *by* S. O'Doherty et al.

Anonymous Referee #2

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I congratulate the authors to this work, which reports global trends and emissions of two rapidly increasing greenhouse gases from a high frequency observational network. In that it addresses very relevant scientific questions within the scope of ACP. It also presents a wealth of novel data and reaches substantial conclusions, which are sufficiently supported by the high quality data. I consider the scientific methods valid but not clearly outlined in all cases. Another weakness is the inclusion and especially the lack of comparison to other published mixing ratio time series of these two gases. The same is partly true for the emissions. The overall presentation is mostly well structured, clear, and concise. Finally I suggest including a link to the online archive of the actual

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underlying high frequency data, at least in the supplementary material. More specific comments can be found below.

P3, l7: As of which year?

P3, l20-22: I suggest adding “mainly” as there are some other uses.

P4, l10: The lifetime of HFC-23 is much longer than 50 years.

P4, l15: These GWPs are only high on average.

P5, l4: If that second period starts on 1 January 2013, why hasn’t it entered into force yet?

P5, l9-12: It might be worth referencing at least some of the non-AGAGE publications “assessing the accuracy of globally and regionally aggregated reductions or increases in emissions of individual greenhouse gases...”. Especially since the term “greenhouse gases” includes studies on CO2, CH4, and N2O.

P5, l12-13: That is not quite true. Both HFC-143a and HFC-32 are included in Rigby et al. (2014, GRL). One of the main messages of their work is that “half of the world’s HFC emissions were unaccounted for in 2011”.

P6, l4-5: Including this information is a very good idea, but why is it listed very detailed in the introduction and not used anywhere else, e.g. to compare to AGAGE emission estimates in section 4.2? Also, why is the work of Li et al. (2011, EST, cited later) and Miller et al. (2012, JGR) not mentioned here (or compared later)?

P6, l12: This information is outdated. The SPARC Assessment (2013) recommends a lifetime of 51 years for HFC-143a.

P6, l20 and p7, l8: Again, instead of citing outdated work, SPARC (2013) would be better here. This is especially puzzling since many of the authors of this work were also authors of the SPARC Assessment.

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P8, l7-8: I agree that the calibration procedure is well established. But data specific to the calibrations of these two gases is missing here. What was the precision of the calibrations? How many dilutions were prepared? Which mixing ratio range was covered? Was linear response behaviour confirmed?

P8, l17-18: Does that mean that the actual precision of the standards run at each individual instrument was not considered, including changes over time? Does it also mean that the precision was not dependent on the actual concentration in the standard? 0.10 ppt would mean >10 % for HFC-32 in 2003.

P11, l5: Over what period was that rate of increase calculated?

P11, l5-12: So how do these numbers compare with Culbertson et al. (2000), Culbertson et al. (2004), and Greally et al. (2005)?

P11, l12: This should be ppt/year.

P11, l26-27: While I agree, that it is important to cite other AGAGE papers and do not question their excellence: Again, this is not a very representative sample of the literature available on inter-hemispheric gradients of anthropogenic trace gases.

P12, l3-4: I don't agree. Emissions might also shift within hemispheres as demonstrated by Montzka et al. (2009) for HCFCs.

P12, l3-18: Most of this discussion is on emissions. I suggest moving it to section 4.2. Also, why is the discussion on regional emissions limited to Australia and Asia?

P12, l20: I suggest deleting the first "of".

P12, l23: This is inconsistent with Table 3 and the conclusions, both of which suggest that emissions only started in 1981.

P13, l12: Citing a UN presentation is not a traceable (nor a peer-reviewed) reference and in my opinion inappropriate here.

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P22, t2 and p29, f5: Why are the Culbertson and the Miller emissions not shown here?

P25 - 28: Why is there no comparison to other published work in any of these figures (e.g. Culbertson et al. and Miller et al.)?

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 6471, 2014.