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Ocean Science
Discussions
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Interactive comment on “Global Annual Mean Atmospheric Histories, Growth Rates and Seawater Solubility Estimations of the Halogenated Compounds HCFC-22, HCFC-141b, HCFC-142b, HFC-134a, HFC-125, HFC-23, PFC-14 and PFC-116” *by* Pingyang Li et al.

Anonymous Referee #3

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While the overall goal of this paper is very worthwhile, there are many issues listed below by page (P), line (L) and Table numbers (especially the major points indicated) that need to be addressed before this paper is acceptable for OS.

P2 L20: MAJOR POINT-1. This is reasonable for all species for oceanic production, and for PFCs for oceanic destruction. But you provide no evidence that non-negligible destruction is ruled out for the HCFCs and HFCs that could be e.g. prone to hydrolysis.

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Discussion paper

Provide this evidence or state up front that the use of these species as ocean tracers depends on their verification as stable in ocean water.

P3 L5: P4: Please also cite relevant ALE/GAGE/AGAGE papers.

P3 L13: Please also cite relevant ALE/GAGE/AGAGE papers.

P3 L21: “They” not “He”

P4 L14: Need references for this doubling statement.

P5 L3-6: MAJOR POINT-2. But you need to calculate polar air concentrations (where oceanic down-welling maximizes) and not entire extratropical averages. This would best be done by assimilation of all station data into a 2D or 3D model, or at least by using the high latitude AGAGE and NOAA station data only (see also the later P6 L38 comment).

P5 L14-20: The case for differences from the prior Meinshausen et al, 2017 study would be strengthened by addressing MAJOR POINT-2.

P5 L21-25: Again, MAJOR POINT-1, what about potential in situ destruction of these H-containing species?

P5 L35: Change to Prinn, Weiss et al 2018a (new CDIAC website) and add Prinn, Weiss et al 2018b (references given at end of this review).

P5 L38-39: Much more relevant for making this point are the Prinn, Cunnold et al 1992 and Prinn, Weiss et al 2000 studies for the Samoa and Barbados sites showing the way ENSO and Atlantic Hurricanes enhance interhemispheric mixing and thus affect the measurements.at these stations.

P6 L9-10: Add Prinn, Weiss et al, 2018b reference for latest instrumentation.

P6 L10-11: Add Prinn, Weiss et al, 2018b (their Table 1) reference for precisions of ALL 8 of your compounds.

P6 L38 to P7 L2: MAJOR POINT-2 again. I do not understand why you are using only these AGAGE stations and NOAA sampling sites and neglecting AGAGE (e.g. Ny Alesund) and NOAA sites much closer to the polar down-welling regions? Also, MAJOR POINT-3, how are you weighting the ability of the NOAA (4 samples/month?) and AGAGE (900 samples/month?) measurements for computing monthly means? Surely the AGAGE monthly means are much more precise.

P8 L5: Please reference instead the main AGAGE website (agage.mit.edu) that connects to this daughter website only after potential users have read the substantial guidelines for ethical use of AGAGE data on the main website.

P8 L5-18: Some/many of these appear out of date. Check Prinn, Weiss et al, 2018b (their Section 2.6) for SIO-year calibrations, and their Table 5 for latest AGAGE/NOAA conversion factors.

P8-P9 Section 2.9 & Supplement S1: This old smoothing spline method is not very powerful compared to recent machine learning methods (e.g. Bodesheim et al, https://www.earth-syst-sci-data.net/10/1327/2018/). Also, the method appears to be using only the station/sample measurement precisions in computing the errors (see MAJOR POINT-3 about these). Also, MAJOR POINT-4, there is an additional error ("representation error") that takes into account that these point station measurements are not measuring the large volume of the surface atmosphere (extratropical, polar regions) that you are implicitly presuming that they do. In inverse and assimilation techniques these representation errors usually dominate the total measurement error except when mole fraction gradients are negligible (i.e. emissions are negligible). Thus, the errors you are reporting are lower limits to the real errors.

P22 L4-7: This conclusion suggesting "in a way that is optimized" is presently debatable given MAJOR POINTS 2,3,4.

Tables 2a-2h: Change Prinn et al, 2016 to Prinn, Weiss et al 2018a (new CDIAC website) and add Prinn, Weiss et al 2018b (ESSD paper).

Table 3: Some/many of these may be out of date. Check Prinn, Weiss et al, 2018b Section 2.6 for SIO (year) values and Table 5 for AGAGE/NOAA conversion factors.

References: Add Prinn, R.G., D.M. Cunnold, P.G. Simmonds, F.N. Alyea, R. Boldi, A. Crawford, P.J. Fraser, D. Gutzler, D.E. Hartley, R. Rosen, and R. Rasmussen, Global average concentration and trend for hydroxyl radicals deduced from ALE/GAGE trichloroethane (methyl chloroform) data for 1978–1990, J. Geophys. Res., 97, 2445–2461, 1992.

References: Replace Prinn et al 2016 old CDIAC website with this Prinn et al 2018a ESS-DIVE CDIAC website. Prinn, R. G., Weiss, R. F., Arduini, J., Arnold, T., Fraser, P. J., Ganesan, A. L., Gasore, J., Harth, C. M., Hermansen, O., Kim, J., Krummel, P. B., Li, S., Loh, Z. M., Lunder, C. R., Maione, M., Manning, A. J., Miller, B. R., Mitrevski, B., Mühle, J., O'Doherty, S., Park, S., Reimann, S., Rigby, M., Salameh, P. K., Schmidt, R., Simmonds, P. G., Steele, L. P., Vollmer, M. K., Wang, R. H., and Young, D.: The ALE/GAGE/AGAGE Network (DB 1001), http://cdiac.ess-dive.lbl.gov/ndps/alegage.html (https://doi.org/10.3334/CDIAC/atg.db1001), 2018a

References: Add Prinn, Weiss et al 2018b. Prinn, R. G., R. F. Weiss, J. Arduini, T. Arnold, H. L. DeWitt, P. J. Fraser, A. L. Ganesan, J. Gasore, C. M. Harth, O. Hermansen, J. Kim, P. B. Krummel, S. Li, Z. M. Loh, C. R. Lunder, M. Maione, A. J. Manning, B. R. Miller, B. Mitrevski, J. Mühle, S. O'Doherty, S. Park, S. Reimann, M. Rigby, T. Saito, P. K. Salameh, R. Schmidt,P. G. Simmonds, L. P. Steele, M. K. Vollmer, R. H. Wang, B. Yao, Y. Yokouchi, D. Young, and L. Zhou: History of chemically and radiatively important atmospheric gases from the Advanced Global Atmospheric Gases Experiment (AGAGE), Earth Syst. Sci. Data, 10, 985-1018, https://doi.org/10.5194/essd-10-985-2018, 2018b.

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