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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Uncertainty analysis of projections of ozone-depleting substances: mixing ratios, EESC, ODPs, and GWPs" *by* G. J. M. Velders and J. S. Daniel

Anonymous Referee #1

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Paper summary: This paper generates a new scenario for the major ozone depleting substances (ODSs). The paper also generates uncertainties for these future projections of ODSs, along with new estimates of ODPs and GWPs. This is the first comprehensive analysis of uncertainties in ODS projections into the 21st century.

Recommendation: Publish with minor revisions. The paper is well written with a very thorough analysis of the uncertainties that would accompany future ODS levels.

Major Comments:

The formulation of the global mean mixing ratio includes a factor "that relates the mass

emitted to the global mean mixing ratio". This factor needs to be included because emissions are at the surface, while the loss is typically in the stratosphere. As the emissions of a compound begin at the surface, the loss will not begin until that compound reaches the stratosphere. In this manuscript, the factor (1.07) is a constant for ALL gases except CH3Br (1.16).

The authors should also include a table of mixing ratios vs. year for this new scenario.

Specific Comments (page, line):

Don't use CI for confidence limit. Everyone thinks CI means chlorine.

There is a mix of methods for quoting uncertainty. Sometimes a range is cited, "... from 0.30 to 0.34Wm−2 (95% CI) ..." while sometimes a percentage, "The uncertainties (95% CI) in ODPs are about 30 to 35% ...". I would recommend that you try to homogenize this across the paper.

28019, 17 "models begun to have a slow enough stratospheric circulation". This is not correct. Model transport algorithms have advanced significantly over the last 20 years. This resulted in greatly improved ability to properly model age-of-air.

28021, 13 "using a fixed factor." What is this fixed factor? Drop this clause. Define later in the page after the factor appears in the equation.

28022, 24 It is unclear to me what is meant by the "bank emission factor (Ef)". Please clarify.

28022, 2-3, Where do the 1.07 and 1.16 values come from? I couldn't find it in WMO (2011).

28022, 11 "Future emissions are estimated from a scenario of future production" Define what you mean by the scenario of future production.

28027, 26 This 0.9 factor is not justified. Please add some text as to why such a number is appropriate.

28036, 18 “ODSs do not only . . .” to “ODSs not only ...”

28040, 18. Is this equation necessary?

28041, 27 Don’t use Cl for confidence limit. Everyone thinks Cl means chlorine.

28041, 25. Error “. . . probably based on s statement in IPCC (1995) . . .”

28041, 23. A longish paragraph that basically points out the IPCC doesn’t do GWP uncertainty correctly. I would shorten this para considerably. You’ve done the estimate to a much better degree. Just say that.

28042, 17. A very weak opening paragraph to the Conclusions. I suggest, “A new ODS scenario (with uncertainties) has been derived . . .”

28042, 9-10. I would rewrite uncertainties in the paper as: “The GWP weighted emissions (Fig. 9) peaked around 1988 at 9.7 GtCO2-eq yr$-$1 with a possible 8.1-11.8 GtCO2-eq yr$-$1 range”

28044, 20 There is also an important point here that the lifetimes of all of these gases change as these factors change.

28045, 21. A 100% error for the ODP? Maybe it would be better to quote the actual range. I doubt that we realistically believe that the ODP for any of these Br species could be zero.

28045, 22-25. The ODP values in the MP are numbers in a political document that were extracted from the WMO assessments. I would remove commentary on the MP ODPs, and more explicitly point to the ODPs in the older assessments.

28045, 25. Weak sentence to open the paragraph. “Based on our new scenario, we have revised the ODS climate radiative forcing.”

28045, 26. I would actually quote the total RF and put in brackets the range.

28051, Table 1. Please add the SPARC (2013) reference to the caption, since the table

is largely adapted from SPARC (2013).

28052, Table 2. Please consider adding the “relative” uncertainty contributed by these individual factors.

28056, Table 4. (a) The fractional uncertainty values can be a bit misleading. For example, Halon-1201 is 96%, but I doubt we would reduce this ODP to near zero. (b) you might consider bolding values that are substantially changed.

28057, Table 5. Bold values that are substantially changed, say more than 10%.

28060, Fig. 3. Drop the thick black lines that “outline” the colors. They tend to obscure the “possible” values. Same with 4, 5, 7, 8, and 9. Leave the thick black line that shows the mean.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 28017, 2013.