

Interactive comment on “Trends in N₂O and SF₆ mole fraction in archived air samples from Cape Meares, Oregon (USA) 1978–1996” by Terry C. Rolfe and Andrew L. Rice

Anonymous Referee #3

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The paper on trends of N₂O and SF₆ from archived air samples from Cape Meares, Oregon is concise and reasonably well written. Though there are other long-term measurements of N₂O in the 1980s and 1990s analysis techniques have steadily improved. The SF₆ data presented is one of only a few precise time-series measurements of this important trace gas in the 1980s and early 90s. The data presented in this paper benefits from using the best modern method for measuring SF₆ and N₂O especially when considering the limited air in archive samples. The data and subject are certainly appropriate for publication. Please review the comments below.

General and Specific Comments

C1

In some cases, the succinctness of the paper leads to some ambiguity or lack of understanding for the reader. Maybe the authors could expand on a couple of the following points or ideas.

Page 3, line 10. “Models have shown that future climate conditions will likely amplify N₂O production”. Expand on this thought. Why is this so?

Page 3, line 15. Add Hall et al. 2011

Page 3, line 20. Consider adding the following citation for a recent estimate of SF₆ lifetime.

E. A. Ray et al., Quantification of the SF₆ lifetime based on mesospheric loss measured in the stratospheric polar vortex. *J Geophys Res* 122, 4636-4648 (2017).

Page 5, line 4. How did you arrive at the detector temperature of 310 C? Was it optimized for N₂O and or SF₆?

Page 5, line 9. Maybe not necessary to the paper. Why sample the archive air 6 times and then the reference gas 6 times instead of alternating between the two types of samples? Wouldn't alternating better track signal drift from injection to injection?

Page 7, Results. Can you comment on why there were some large outliers? Problems with the sample or the integrity of a few flasks? Were the outliers the same for both N₂O and SF₆? Why were two different criteria for residual outliers (2-sigma for N₂O and 3-sigma for SF₆) used?

Page 7, line 20. It is uncertain to the reviewer what “bootstrapping residual variability 1000 times” means. Did you sample subsample the data 1000 times and re-smooth?

Page 8, line 5. You could cite Geller et al. as well.

Geller, L. S., J. W. Elkins, J. M. Lobert, A.D. Clarke, D. F. Hurst, J. H. Butler, and R. C. Myers, Tropospheric SF₆: observed latitudinal distribution and trends, derived emissions and interhemispheric exchange time, *Geophys. Res. Len.*, 24, 675-8, 1997.

C2

Technical Corrections

Page 1, line 14. "prior to" to "before"

Page 2, line 22. "major" to "primary"

Page 4, line 20. "Peak separation is achieved by two Poropak Q 80/100 mesh columns" to "Two Poropak Q 80/100 mesh columns achieve peak separation"

Page 4, line 22. "to significantly improve baseline signal stability" to "to improve baseline signal stability significantly"

Page 5, line 20. "a two-week period" to "two weeks"

Page 6, line 4. "Error" to "The error"

Page 6, line 6. "To characterize of the" to "To characterize the" (remove the "of")

Page 6, line 8. "a N₂O" to "an N₂O"

Page 7, line 17. "analysis" to "the analysis"

Page 7, line 29. "Prinn et al." is missing the period

Page 9, line 12. Add a comma after Canada.

Page 10, line 19. "have amplitude" to "have an amplitude"

Page 10, line 22. "seasonal amplitude" to "the seasonal amplitude"

Page 11, line 10. "and minimum amplitude" to "and a minimum amplitude"

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