

## ***Interactive comment on “Trends in N<sub>2</sub>O and SF<sub>6</sub> mole fraction in archived air samples from Cape Meares, Oregon (USA) 1978–1996” by Terry C. Rolfe and Andrew L. Rice***

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Received and published: 18 March 2019

Rolfe and Rice present a consistent data set of N<sub>2</sub>O and SF<sub>6</sub> based on reanalysed whole air samples from an air archive from samples collected at Cape Meares in Oregon. This is an interesting and important study. Given that this is to a large degree a technical paper, I find that some of the details of the data retrieval could be presented more carefully. E.g. Fig 1. is not very nice and should be improved. I also have some comments with respect to the NL correction: A linear function to correct for non-linearity can only be valid over a restricted concentration range (as described by the authors). In the case of SF<sub>6</sub> the linear correction term is applied over the entire range (from 0.59

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-8.76 ppt) it is doubtful if this is a non-linearity effect, but rather it could be a contamination from the zero gas. In this respect, I suggest to present the NL plots (Fig 4) as difference plots, i.e. (measured – expected) vs. expected. Otherwise small deviations will not be visible and it is difficult for the reader to assess the non-linearity.

One additional importance of the paper may actually be to make this air archive better known to the scientific community, as it may be an important addition to the well-known air archive from Cape Grim in Tasmania. In so far I would also encourage the authors to provide more details on the archive itself, including possibly a note on the availability of the archive for other studies and the amount of air stored in the tanks.

Also, for such a study, a statement on data availability should be included.

I have a range of more specific comments which are partly related to the presentation and partly to the data analysis.

p.1. l. 17.: is this precision for SF<sub>6</sub> not dependant on the mixing ratio, which has changed significantly during this time period?

p. 1. l. 29: please specify that the stability is only valid for these compounds. Other gases may be much more critical.

p.2.l. 13.: also the temporal resolution of firm samples is limited.

p. 2.l. 17.: I think it would be worthwhile to add some comments here, especially mention the best known air archive, i.e. the one from Cape Grim, incl. some references to reanalysis from air archives, e.g. from Laube, Oram and Vollmer.

p.2.,l. 20: a reference to the updated trend from the most recent WMO report (chapter1) could be made here).

p.3. l. 20: please include some discussion on the recent re-evaluation of the SF<sub>6</sub> atmospheric lifetime e.g. by Ray et al.,

p.5. l., 22: I think some discussion on the reproducibility for low SF<sub>6</sub> mixing ratios

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is necessary here. Does it differ from those of the NOAA standards? What is the implication for the reanalysis?

p.6. l1ff.: Have the authors considered a cross interference between N<sub>2</sub>O and CO<sub>2</sub>? Are they separated chromatographically? If not then there could be a co-elution problem and then the dilution of the standard may result in a different matrix than in the case of air (which has shown different relative trends of CO<sub>2</sub> and N<sub>2</sub>O). Co-elution of CO<sub>2</sub> and N<sub>2</sub>O may effect the sensitivity of the detector, which impacts the non-linearity correction.

p.6. l. 23: I think it is wrong to refer to measured N<sub>2</sub>O here; this is the “linear-response” evaluation.

p.7.l.3.: as above

p.7. l. 6: a range of values for which such a linear correction has been applied should be given here also.

Please use the newest AGAGE overall reference: Prinn et al., Earth System Sci. Data, 2018

p.8. l. 25: give years for the increase rates.

p.9. l. 13.: the ref. to Levin should be placed behind 1995.

p.9.l.17: as Edgar is largely derived from an inversion of observations, it is somewhat a circular argument to state that there is agreement.

p.9. l. 31.: this sentence sounds funny.

p.10. l. 11.: is the seasonality independent of the mixing ratios? Otherwise please give the years for which this is valid.

p.10.l24.: specify what you mean by vertical diffusion here.

p.11.l. 3: check grammar on this sentence.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-114>, 2019.

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