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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global trends and European emissions of tetrafluoromethane (CF_4), hexafluoroethane (C_2F_6) and octafluoropropane (C_3F_8)" *by* Daniel Say et al.

Anonymous Referee #2

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Review for:

Title: "Global trends and European emissions of tetrafluoromethane (CF4), hexafluoroethane (C2F6) and octafluoropropane (C3F8)" Authors: Say et al.

Say et al. used the atmospheric measurements from AGAGE to infer global and European emissions of three PFCs (CF4, C2F6, C3F8). They further compare their regional top-down estimates and UNFCCC reports for emissions of these gases to assess the accuracy of national GHG reporting. The authors used well-established methods to conduct their analysis. The discussion is mostly well written. I would only suggest some clarification in their description of methods and some minor modifications.

Line 120: "the annual emissions growth rate would be zero plus or minus 20% of the maximum emissions. . .". What do you mean by "growth rates +- emissions"?

Lines 155 – 165: Could you please justify why it is reasonable to assume model uncertainty being "a combination of the prior baseline uncertainty and the magnitude of the median pollution event at the measurement location per year" and the correlation of the off-diagnonal elements in the model-data mismatch matrix is 12 hours?

Lines 215 – 216: the authors find no statistical significance in the emission trend of CF4 given the uncertainty of the estimated emissions. I am not sure I am convinced for this augment. Although the uncertainty seems relatively large in their derived annual emissions. They do show a clear reduction of emissions just visually. I would recommend the authors to calculate the trend and its statistical uncertainty. One way to do that could be to first generate hundreds of annual emissions sets by randomly sampling the errors of the annual emission estimates. Then you can conduct linear regression for those emission sets. It will yield a range of slopes / trends, which can be used for deriving the uncertainty of the slope.

Lines 225 – 230: the authors only mentioned Ireland's CF4 emissions have been increasing in recent years. How about Germany and France? Their posterior emissions also show indications of increasing emissions in recent years.

Line 258. Similar to what I suggested above, calculate the uncertainty of the emission trend over NW Europe, then assess if there is a statistically significant trend. Also, why the uncertainty in 2008 is much larger than other years? Is it because less observations in this year? If that is the case, maybe considering removing this year when constructing the trend and uncertainty.

Line 287: "C3F8 is the only PFC for which northwest Europe's. emissions increased relative to the global total." This statement seems contradicting with the previous sentence "northwest European emissions of C3F8 285 exhibited no statistically significant trend over the measurements period".

Lines 344 – 345: It is an interesting idea to suggest using C3F8 to be a transport tracer to evaluate transport errors. It would only work well if we know its emission magnitudes and distribution accurately. You mentioned about this in Section 3.2.4, but omitted it in this conclusion sentence.

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