Global and regional emissions of 1,2-dichloroethane derived from AGAGE and NOAA observations

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Comment: The manuscript "Global and regional emissions of 1,2-dichloroethane derived from AGAGE and NOAA observations" is of great importance, and the atmospheric chemistry scientific community will greatly benefit from its findings. The manuscript is very well written, and the data are clearly presented. The quality of the dataset is very high, as is the discussion of all the potential sources of errors, limitations, and areas of uncertainty. I only have a few minor comments, and after they have been considered by the authors, the paper is, in my opinion, ready for publication.

Reply: We thank the referee for their positive review and address their comments (in black) below (in blue).

Comment: L. 7: "…making it the third most abundant Cl-VSLS", I would add the two species that are ranked first and second.

Reply: edited to: "making it the third most abundant Cl-VSLS after dichloromethane and chloroform."

Comment: L. 66–70: What is a "potential effect on stratospheric Cl- abundance" other than the "contribution to direct stratospheric ozone depletion"? However, I may simply be misunderstanding your point here.

Reply: We have amended the sentence to clarify that we are still referring to the contribution to direct stratospheric ozone depletion: *"Its current contribution to direct stratospheric ozone depletion was estimated to be comparatively small (less than 1 % as an annual average in 2020) (Hossaini et al., 2024), but this contribution is associated with high uncertainty due to its dependence on DCE emission location and time (Daniel and Reimann et al., 2022; Hossaini et al., 2024; Laube and Tegtmeier et al., 2022)"*

Comment: L. 109: Could you please clarify whether the 0.5% difference refers to differences between the two collection methods or between the two flasks in the paired set?

Reply: This is the difference between the two collection methods. We have rephrased this to: *"The two flask collection methods were used side-by-side at Mauna Loa from July 2021 to November 2022. During this time, the difference in monthly mean DCE mole fraction calculated using glass flask samples instead of stainless-steel flask samples was less than 0.5 % on average."*

Comment: The countries included in NW Europe do not — rightfully, from a geographic point of view — include Italy or Switzerland. However, of the five sampling sites whose measurements were used to determine NW European emissions, one

is located in Switzerland and another in Italy. I was wondering about what I perceive as a discrepancy between the measuring sites and the domain used for the inferred emissions.

Reply: We selected the countries for which we report emissions based on the country-level error reduction in the posterior relative to the prior. This partly depends on the combined footprint sensitivity for the sites within the network, but it also depends on the ability of the inversion to separate a given country's emissions from both boundary condition errors and emissions closer to the observation sites. This is particularly relevant for Italy, Spain and Portugal – the network is sensitive to emissions from these countries in the sense that such emissions lead to enhancements at the measurement sites, but these emissions are not spatially well constrained and so the country-level error reduction is low. We have added the following sentence to section 2.4.3: *"The seven countries for which we report aggregate emissions were selected based on the country-level error reduction in the posterior relative to the prior."*

Comment: L. 320: "There is no consistent trend of global mean atmospheric abundance over this period". What kind of trend were you expecting (or what trend could possibly have been present) that you do not actually observe? For example, a steady increase? Do you have any comments regarding the annual fluctuations in DCE levels?

Reply: Here we are referring to the fact that the global mole fraction growth rate is positive is some years and negative in others. We have expanded this to: *"There is not a monotonic trend in the annual average global atmospheric abundance over this period. We observe growth between 2017 and 2018/2019, followed by a decline until 2022, returning to growth from 2022 to 2023. This may reflect changes in emissions (see Sect. 3.2), although any changes in the DCE sink over this time period could also contribute."*

Comment: Figure 3: Cosmetic issue, I feel that the blue used for the symbol representing Palmer Station is too similar to those used for Summit and Barrow.

Reply: We changed the plots to use a larger variety of colours in each sub-plot. We paid attention to keep the colours such that their hues can still be distinguished by colour blind people.