

ESSD 2023-306 – Answers to reviewer 1:

*I read this document with great interest. Generally the data look useful and credible. However, it seems the authors did not think thoroughly how to present the data. During reading, things sometimes remain unclear. In some instances, clarification came later (e.g. on the used scaling of emissions). Sometimes, things remained unclear (e.g. short cycle co2 emissions).*

*For the rest, I include an annotated PDF, which contains my remarks.*

Answer: We thank the reviewer for his/her comments. We have taken into account all the comments of the reviewer, and we think the paper presents the data in a clearer way now.

*There is one issue with the NO<sub>x</sub> emissions. As far as I am aware, "normal" units are in mass NO<sub>2</sub>. Now, the authors use mass NO, which might lead to confusion. This is maybe an issue to check with the other inventories, although this information is normally difficult to find! (at least the authors mention the unit now clearly).*

There is no consensus on the mass of NO<sub>x</sub>: many groups working on air quality issues use NO<sub>x</sub> as NO<sub>2</sub>, many groups working on climate and chemistry-climate issues use NO<sub>x</sub> as NO, and other groups working on natural sources as well as inverse studies often use NO<sub>x</sub> as N. In the paper, we have used the standard unit used in the emissions database of the GEIA (Global Emissions Initiative) international project, i.e. the ECCAD database mentioned in the paper, where the standard unit is NO<sub>x</sub> as NO. In order to make the use of this unit clearer, we have indicated in the figures and table captions: NO<sub>x</sub> as NO instead of NO<sub>x</sub>-NO.

Answers to the annotated PDF: Note that the lines indicated in the answer correspond to the annotated PDF provided by the reviewer

- Line 26: the words “emitted at the surface” have been removed, as the paper also describes the vertical distribution of the emissions from aircraft.
- Line 67: “make on-line evaluation of the emissions”. This text which was not very clear has been removed.
- Lines 73 and 74: we have removed the full section indicating why the CAMS-GLOB-ANT dataset does not provide the emissions of PMs, as there is no need to single out these two species, as mentioned by Reviewer 2. This section indicated a few papers that have also evaluated the CAMS-GLOB-ANT emissions in atmospheric models: the corresponding sentences have been now included at the end of Section 5.
- Line 107: In order to make the paper clearer, we now just mention in the description of the EDGAR and CEDS emissions the list of species included in the CAMS-GLOB-ANT. The species not included in CAMS-GLOB-ANT (such as PMs, SO<sub>4</sub> and ash) are not mentioned anymore.
- Line 143: EDGAR version 5 does not provide weekly or daily profiles, just monthly temporal profiles.

- Line 148: the figure caption has been changed as suggested by the reviewer, and it now indicates that it shows the temporal weights for the residential sector.
- Lines 162 and 166: the text was unclear and there was repetition in what Table S1 indicates. The text has been rewritten, and now indicates clearly the correspondence between the CAMS-GLOB-ANT, EDGAR and CEDS sectors.
- Line 188: we indicate now that Figure 2 shows the relative change in the emissions between 2013 and 2019, 2014 and 2019, 2015 and 2019. The figure caption has also been changed to indicate that relative changes are plotted.
- Line 190: we rephrased the definition of the quantity we called the “growth factor” and it is now indicated that this factor is dimensionless
- Line 214: as indicated above, the abstract does not mention anymore that the paper is about surface emissions
- Line 215: as mentioned in lines 240-247, the CAMS-GLOB-ANT dataset does not include the impact of the Covid lockdowns on the emissions in 2020. The users of the CAMS-GLOB-ANT can implement the CONFORM adjustment factors to take into account the impact of the COVID pandemic on the emissions.
- Lines 257: as for other emission datasets (EDGAR, CEDS, HTAP, ECLIPSE, etc.), no recommendation is given on the vertical profiles of emissions, except for the aircraft emissions.
- Lines 327 and 329: SO<sub>2</sub> has been changed into SO<sub>2</sub>
- Line 361: CH<sub>4</sub> has been changed to CH<sub>4</sub>, and the word “emissions” has been added after CH<sub>4</sub>.
- Line 389: CH<sub>4</sub> and NH<sub>3</sub> have been changed to CH<sub>4</sub> and NH<sub>3</sub>
- Lines 456: SO<sub>2</sub> has been changed into SO<sub>2</sub>
- Line 485: the division between the short cycle and excluding the short cycle emissions is now better explained at the beginning of Section 3.1, with the following sentence: “CO<sub>2</sub> (divided into short organic cycle (released by combusting biofuels, agricultural waste burning or field burning) and excluding the short cycle),...”
- Comments on the tables: as indicated at the beginning of the answers to Reviewer 1, we have changed the figures and table captions from “NO<sub>x</sub>-NO” to “NO<sub>x</sub> as NO”.
- Line 746: the values of the totals for the region for 2000 and 2023 have been added, and the values of the percentages are now shown in the figure.