

Author's response

Dear Editor,

Thank you for reviewing our manuscript number ESS-2021-2018. We have gone through all the referee's commentaries and adjusted the manuscript accordingly. After this paragraph you will find our responses. The style used in the response letter is the following: the original general comments made by the editor are kept in normal text (initiated with R), our responses are *in blue italics initiating with A* (Authors).

Topical Editor (EC1)

Hugo Denier van der Gon, 05 Jan 2022

Dear Authors,

Thank you for your detailed responses and revision of the MS.

In my opinion the paper is acceptable for publication provided a few minor corrections are made as outlined below:

R1: In your title please change "on-road" to "road" (in your MS_ATC that was not adjusted)

A: The change has been done and the corrected version uploaded.

R1: When you introduce the global inventories, please mention that these are not independent. For historic years CAMS is mostly based on EDGAR but extrapolated to more recent years using other information such as trends from CEDS.

A: Thanks for the comment. In page 20, paragraph starting at line 398, we added another reference to CEDS (Smith et al., 2015) and the following phrase:

"It is worth mentioning that EDGAR, CAMS and CEDS are not independent. For historic years CAMS is mostly based on EDGAR but extrapolated to more recent years, using other information such as trends from CEDS."

R1: On page 22 bottom of page in MS_ATC version you write "Finally, it is worth noting that CAMS NOx emissions were significantly and lower than EDGAR estimates, although they follow similar trends. This was an unexpected finding, since CAMS emissions of other pollutants were essentially the same as EDGAR's between 1990 and 2011 and differed only in the trends of the following years, becoming linear for CAMS. A revision of CAMS NOx emissions is, therefore, recommended."

A: Following and accepting next comment, we deleted the phrase mentioned here.

R1: Please check. I think this is an error in how NOx is reported (as kg NO2 or kg NO). In EDGAR as NO2 and in CAMS as NO. This is a difference of $(14+32) / (14+16) = 1.5333$ - which probably explains the difference you see in Figure 10. If this correct – pleased adjust the above paragraph accordingly.

A: We appreciate the comment and corrected both the text and Figure 10, using the factor 1.5333. Previously, we detected this difference between NOx reported at the EDGAR official database and EDGAR-ECCAD database but didn't apply the same factor when including CAMS in our analysis.

R1: Page 23 on your figure 11 you write:

“Considering the differences between EDGAR data and this study’s results for Chile, trends in CO/NOx ratio for other European and LAC countries were included.”

Please change to for “other European and LAC countries from EDGAR were included” - This is important because you cannot make a similar comparison as for Chile where you have EDGAR and INEMA.

A: The phrase has been changed according to the suggestion, as follows:

“Considering the differences between EDGAR data and this study’s results for Chile, trends in CO/NOx ratio for other European and LAC countries from EDGAR were included.”

R1: Furthermore, on figure 11 page 23. “Chile’s CO/NOx ratios are in the same range as those found in European countries, which is supported by the fleet renewal shown in Figure 11. Most of the Chilean fleet consists of Euro II/2 and Euro III/3 vehicles, which have much lower CO/NOx ratios than pre-Euro ones. This suggests that vehicle fleet assumptions and, therefore, emission factors used in global emission inventories for LAC countries should be revised.”

R1: A few changes in this paragraph are needed.

First sentence: figure 11 does not show fleet renewal but CO/NOx ratio’s. The fleet renewal may be the cause for the similarity but it is not shown here. That would be a different figure. Please correct.

A: The call to Figure 11 has been changed to “Figures 3 and 4”, where fleet renewal is shown.

On the last sentence (emission factors used in global emission inventories for LAC countries should be revised.). I don’t think you can generalize to all LAC countries only based on results for Chile as it may not be representative. You suggest it for Chile by showing the local (this study) and the EDGAR data but for the other countries you only show EDGAR ratio’s. To conclude more it would be necessary to make a further analysis including national Argentina, Austrian etc. values and compare those with EDGAR, which is beyond the scope of the current paper. Therefore I would suggest to change that sentence to something like “Our analysis for Chile suggests that a careful analysis of national versus global estimates and/or emission factors for road transport emissions is needed for other LAC countries as well.

A: The suggestion has been made, replacing the phrase " This suggests that vehicle fleet assumptions and, therefore, emission factors used in global emission inventories for LAC countries should be revised" by "Our analysis for Chile suggests that a careful analysis of national versus global estimates and/or emission factors for road transport emissions is needed for other LAC countries as well."

Final comments: We performed a final full revision of the text and found several typos and mistakes when numbering tables, figures, and equations. We made corrections, accordingly, shown on track changes as follows:

Page 2, line 51: “For” by “for”.

Page 2, line 57: “Ministry for the Environment” by “Ministry of the Environment”.

Page 3, line 73: “Ministry of Environment” by “Ministry of the Environment”.

Page 7, line 151: “Equation 1” by “Equation 2”.

Page 7, line 155: "equation 1" by "Equation 2".

Page 8, line 159: "Equation 1" by "Equation 2".

Page 9, line 205: "Table 1" by "Table 4".

Page 11, line 241: "section 2.3" by "sections 2.1 and 2.2".

Page 13, lines 287 and 290: "Table 6" by "Table 5".

Page 14, lines 317, 310, 311 and 315: "Table 6" by "Table 7".

Page 14, Table 7: superscript at "-1" for PM.

Page 15, line 326: "Table 8" by "Table 7".

Page 15, line 328: "Table 8" by "Table 7".

Page 15, Table 8: superscript at "-1" for BC and CO.

Page 16, Figure 5: "(b) and (c)" by "(c) and (d)" for PM2.5 and BC.

Page 17, line 355: "spam" by "span".

Page 17, line 371: "2021" by "2022" for the reference of Alamos et al.

Page 22, line 460: "CO (right)" by "NOx (right)".

Page 23, line 492: "EDGAR" by "EDGAR, CAMS AND CEDS".

Page 25, Acknowledgments: thanks to data providers.

Page 25, Financial support: This section has been added, moving funding providers from above section.

Page 25, line 554: The first reference (Alamos et al) has been updated.