Suggestions for revision or reasons for rejection

(visible to the public if the article is accepted and published)

The manuscript has been improved. However, there still appear some errors or inconsistencies . Below lists some potential errors that I noted. I would suggest the authors to carefully go through the manuscript to check for plotting errors, typos, etc.

China's 2014 methane emissions (2nd UNFCCC BUR) are inconsistent between Fig. 1 (~60 Tg), Fig. 3 (~42 Tg), and L364-365 (32 Tg).

We thank the reviewer for noticing these small inconsistencies.
We checked again the numbers for China and In Figure 1 total emissions should be for the year 2014 55.29 Tg CH4 as reported by Table 2-10 page 19 second BUR. Indeed we found a unit typo for the IPPU emissions, we had 6 Tg but the correct unit was 6 kt, and we change accordingly.
We also corrected the value accordingly in Figure 3 where we show the anthropogenic excl LULUCF, and they became 53.57 Tg CH4.

We also corrected the previous years, by adapting the GWP conversion factor for CH4 from 25 (which we previously used for all countries) to 21 as reported by China.
However, in the 2nd Chinese BUR we note that by converting the sectoral totals from CO2eq to CH4 (GWP = 21) and summing up the sectoral values from Tables 2-13, 2-14, 2-15 and 2-16, we obtain a slightly different value than reported under line Total w/ LULUCF. We therefore might still see in the figures small differences.
We adapted the numbers for China also for all figures.

On line 374 we corrected the value to 55 Tg CH4.

The model names are inconsistent between legends of Fig. 4 and Table 2

Indeed, we refer to CAMS and MIROC4-ACTM as both runs instead of listing their full names. We changed accordingly, as the reviewer suggested, to match the model names in all figure captions and Table 2.

USA panel of Fig. 3: The mean value of BUR (black dot) is lower than the all yearly values, which is clearly incorrect. Meanwhile, the mean of value of EDGARv7 (grey) appears to be higher than most yearly values.

Thank you for this observation, we corrected the averages.

L546: "... increased emissions after '2019', ..., picks up again after '2018' ". The same thing repeated in one sentence.

Thank you, we rephrased as following: "Trend wise, all inversions agree on a slight decrease after 2013 and show increased emissions after 2018"

Russia's total emissions are inconsistent between Fig. 4 and Fig. 5.

In Figure 4 we show the time series and mean value of 2009-2021, due to the fact that TD estimates are only available after 2009. In Figure 5 we show for all the data products the average between 2015-last available year. The mean values are 12.85 Tg in Figure 4 and 13 Tg for Figure 5.

L765-769. The logic here is not very clear. More in-situ data do not provide information on "how dependent the posterior estimate is on the prior".

We agree that the in-situ data won't improve directly the posterior, however would make the prior more strong, and therefore the posterior will be better constrained by the inversion. We propose to delete the following sentence: " *Whereas the comparison of an inversion with NGHGIs or other inversions would be made more robust by having more information on how dependent the posterior estimate is on the prior.*"

As kindly agreed by the editor, we added a BU dataset, TNO_PED18-21, developed under the CoCO2 project, as input for CoCO2 WP3 (Development of global modelling and data assimilation capacity in an MVS), CoCO2 WP4 (Local and regional modelling and data assimilation) and the CO2MVS in general. It is a UNFCCC based product, for the EU27, Norway, Switzerland, UK and for Africa on the DACCIWAv2 inventory developed under CoCO2 and CAMS-GLOB-ANTv5 for other global countries. The objective was to compile a regional and global prior emission dataset for 2018 and 2021 consisting of individual components that modellers can use and that covers all relevant species and sectors, including anthropogenic, biosphere and ocean fluxes. The dataset is based on a consistent bottom-up approach at regional or global scale to ensure consistency and transparency. The TNO_CoCO2_PED appears in:
Table 1
L275, L284-288
L418-420
Figure 3 and its caption

L436-439
SI