Review of the Global Carbon Budget 2022

Thank you for the opportunity I was offered to be reviewer and I would also like to thank the authors for this excellent study. This latest version of the global carbon budget study is a useful and comprehensive work for the carbon community. Please find below a few comments.

General and technical comments:

ln.333. How the added decomposition of E_{LUC} into its main component improve or change the Glocal Carbon Budget?

ln.353. It should be BP energy company.

ln.401-403. these sentences could be rearrange and rewrote in one sentence. The information seem redundant.

Ln.403. 3 independent datasets for peat drainage are included. It is not well clear which are the corresponding datasets in the section 2.2.1.

ln.539. A fourth simulation has been added in this 2022 paper compared to the 2021 paper. It is not clear what the added simulation bring to the study in comparison to the previous one.

ln.617. CMS-Flux is assimilating both GOSAT and OCO-2 simultaneously. Even if these sensors have similar spectral bands, their calibration are not perform in similar ways which could bring non-negligeable biases in the inversion result. It would, hence, be interesting to know (useful for the inversion results of this manuscript) how the biases resulted from the joint GOSAT and OCO-2 assimilation was considered in the CMS-Flux inversion.

Section 3.1.1 Even though the values have been updated, the text is similar to the 2021 paper. It would have been interested, for instance, to add further information comparing the 1850-2021 (including the post-covid lock-down) and 1850-2020 (including the covid lock-down) periods. Some of the difference between 2021 and 2020 are mentioned in section 3.1.3 but this could be mentioned in section 3.1.1 as well. Ln 672, in comparison to the 1850-2020 period, the 1850-2021 one has only a decrease of 1%

from natural gas but the contribution of the other sources have not changed. Do you know if the reduction in natural gas emission is coming from a specific region or not?

ln.679. need to remove a parenthesis after Hoesly et al., 2018.

ln.773. You mention "these changes […] lead to higher net emissions in Brazil in the last decades compared to last year's GCB". It would be useful here to add some carbon emission values. How much carbon emission are you talking about?

ln.777. You mention that the increase in deforestation over Brazil and the associated carbon emission is not well capture. Do you have an estimation of how much carbon emission from the deforestation in Brazil is missing in your estimation? For future GCB, do you consider additional measurements (i.e. chlorophyll fluorescence or vegetation canopy from spaceborne platforms) to help better address and monitor deforestation related to the global carbon budget?

ln.1049-1050. Why not using an other dataset independent from the data products?

ln.1242. I could not find Section 2.7.4.

ln.1345. CO2 should be CO_2