

Comment on **essd-2021-228**

Anonymous Referee #2

Referee comment on "A comprehensive and synthetic dataset for global, regional, and national greenhouse gas emissions by sector 1970–2018 with an extension to 2019" by Jan C. Minx et al., Earth Syst. Sci. Data Discuss.,
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The authors have developed a very comprehensive dataset for GHGs emissions by country, sector, and year. Emissions of CO₂, CH₄, N₂O and fluorinated gases between 1970 and 2019 are compiled and integrated from a set of commonly used global emission inventories and emission models. Trends and drivers of global emissions have been investigated based on the newly developed emission dataset. Overall, this paper provides useful and interesting results for climate science. I have two concerns about the title and uncertainty assessment of this study, which need to be resolved before it can be accepted for publication in ESSD.

First, the title of the manuscript seemingly suggests that this study has developed a new and comprehensive global emission dataset. Whilst this is true to a certain extent, it has also to be acknowledged that the new dataset shown here is created only by harmonizing and combining several other inventories and model results, which is not a development effort for a new emission dataset. In my opinion, the title of this work should make it clear that this is an ensemble-based analysis of emission trends and drivers based on existing datasets.

Second, I do not agree that uncertainties in this dataset are well characterized (line 921 on page 44). Instead, I found that the estimates of uncertainties in this study are rather arbitrary. For example, line 375 on page 18 said that "We base our uncertainty assessment on Friedlingstein et al. (2020) and take $\pm 2.6 \text{ GtCO}_2 \text{ yr}^{-1}$ as a best-value judgment for the $\pm 1\sigma$ uncertainty range (thus $\pm 5.1 \text{ GtCO}_2 \text{ yr}^{-1}$ for $\pm 2\sigma$) in CO₂-LULUCF emissions, constant over the last decades.". Line 483 on page 23 said that "Overall, we apply a best value judgment of $\pm 30\%$ for global anthropogenic methane emissions for a 90% confidence interval.". Although I know that estimating emission uncertainties is quite difficult, I did not fully understand how these values of uncertainties were determined in this study. And I do not think that the quantification of uncertainties in this work has been improved compared to previous literature. Besides, I noticed that the methods used to quantify uncertainties are actually different across CO₂, CH₄, and N₂O. Are these uncertainty values comparable to each other in this study?