

Earth Syst. Sci. Data Discuss., referee comment RC1
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Comment on **essd-2021-235**

Anonymous Referee #1

Referee comment on "Comparing national greenhouse gas budgets reported in UNFCCC inventories against atmospheric inversions" by Zhu Deng et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-235-RC1>, 2021

This is important and long-time awaited paper, describing the methodology and results of making inversion modeling comparable with GHG inventories in the UNFCCC national reporting. The paper provides multidimensional assessment, which considers three major gases: CO₂ (managed and unmanaged land), CH₄ (anthropogenic emissions, fossil, agriculture & waste) and N₂O (anthropogenic), separately for large countries.

The paper provides motivation to different communities and countries to advance the modeling and reporting: Inverse modeling community – to check the reasons for inconsistency between the models and with other estimations; independent validation of country UNFCCC reporting; upscaling in situ measurements; etc.

The advantage of inversions is that they provide insights on seasonal and interannual greenhouse gas fluxes anomalies, e.g. during extreme events such as drought or wildfire, while national inventories tend to average and delay with recording emissions.

The paper is well written, all data processing steps are described, the results are discussed extensively. I have just a few comments.

Line 143: "we chose countries with an area that contains at least 13 grid boxes of the highest resolution grid-scale inversions"? Any reason for such a decision? Was it a pre-condition or did you find out minimum number of pixels (13) after country selection process?

Line 229: "intact forest areas (that are unmanaged, by definition)". Definitions of managed forest are different in different thematic areas and vary in different countries for

UNFCCC reporting.

IPCC Guidelines (2006) defines "Managed land is land where human interventions and practices have been applied to perform production, ecological or social functions". For example, intact forest in a national park is managed to support ecological functions (i.e. the forest is under fire protection). This intact forest is considered as "managed" for UNFCCC reporting. Based IBFRA analysis (unpublished IBFRA report, 2021), 49% of forest area in the IFL - Intact Forest Landscapes (Potapov et al., 2017) polygons belongs to "managed land" according to UNFCCC national reporting in Boreal biome. At the same time substantial amount of "unmanaged forest" are outside of IFL polygons, e.g. northern open woodlands. I understand that in absence of global dataset of managed land the IFL is a logical compromise. However, the readers should be warned about this limitation.