

## ***Interactive comment on “The consolidated European synthesis of CO<sub>2</sub> emissions and removals for EU27 and UK: 1990–2018” by Ana Maria Roxana Petrescu et al.***

**Anonymous Referee #1**

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This paper provides a nice synthesis of the current data sets available for CO<sub>2</sub> emissions and sinks over EU27 and UK region, with some sector disaggregation. Generally, there is a good agreement between different datasets in terms of magnitude and trend for the fossil fuel emissions, although the only fossil fuel inversion product presented has very large uncertainty (much larger than the other bottom-up datasets). All datasets reporting the sinks from the LULUCF sector have a relatively large uncertainty, and there is not always agreement on the sign between the different approaches, particularly for crop land. This is because of differences in the representation of the processes affecting the direct and indirect emissions from LULUCF, the input data used, as well as the definitions of LULUCF (e.g. managed and unmanaged land and land use

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conversions). The paper highlights the complexity of comparing LULUCF data based on different types of approaches and the high uncertainty associated with observation-based inversion approaches. There are several reasons for this, including sparse observing network and high uncertainties in prior and transport models (including effects of boundary conditions when using regional models). The spatial and temporal resolution is another factor that varies a lot from dataset to dataset, as well as the period covered, contributing further to the difficulty of reconciling the different information on the CO<sub>2</sub> emissions at regional scale. Finally, the paper provides recommendations to include missing processes (e.g. lateral fluxes between regions) and to reduce the uncertainties associated with different approaches in order to facilitate the integration of all the information available to support the global stock take exercise set out in the Paris Agreement.

The paper is well written and provides a comprehensive source of information regarding a wide range of public datasets, documenting the pros and cons of each data source. I recommend the paper to be published as it is, with only minor corrections (see list of minor comments below).

Minor comments: -Line 62: Replace “CO<sub>2</sub> land sources/sinks” with “biogenic CO<sub>2</sub> land sources/sinks”.

-Line 93: “represent the sum of the effects of sources and sinks”.

-Line 98: UK does not use atmospheric observations to complement CO<sub>2</sub> (due to difficulty in representing the biogenic fluxes).

-Line 166: Include description of acronyms.

-Lines 169-170: Parenthesis do not match.

-Line 177: Replace “show” with “shown”.

-Line 215: Isn’t the term “CO<sub>2</sub> land fluxes” too generic since the target is LULUCF?

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- Line 238: Replace “then” with “than”.
- Line 243: Replace “differing” with “differ”.
- Table 2: Why is there no contact/lab for BU H&N bookkeeping model?
- Lines 256-257: Numbers with and without LULUCF are not consistent with LULUCF contribution.
- Line 541: Replace “variation trend” with “variation”.
- Line 567: “The sink in ORCHIDEE is due to...”
- Line 605-606: “for instance the CO<sub>2</sub> fertilization effects...”
- Line 673: “by subtracting from the inversion estimates the emissions...”
- Line 718: It is not clear what are the indirect fluxes on managed land included in NGHGs.

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