Answers to Editor Comments

We thank the editor for her remarks that are helpful to improve the manuscript.

Line numbers refer to version 3 of the manuscript.

-- The first reviewer asked for literature values in he abstract. While I think the abstract is not the correct part of the text for further details, this should be incorporated in the introduction. However, I could not find a corresponding modification of the text.

We also felt that there was no place for the reference in the abstract and let them in the general text when comparing with the result. We can add them in the introduction.

Page 2 l 31 "The RTM has been used in many studies to evaluate the fluxes between the atmosphere and ecosystems of trace gases such as CO2, CH4, N2O, H2 or COS (e.g.: Levin et al. (1999); Schmidt et al. (2001); Biraud et al. (2000); Messager (2007); Yver et al. (2009); Hammer and Levin (2009); Lopez et al. (2012); Vogel et al. (2012); Belviso et al. (2013); Grossi et al. (2018); Belviso et al. (2020); Levin et al. (2021); Tong et al. (2023)).

For example, Levin et al. (2021) calculated an estimate of 0.8 mg CH4 m−2h−1 for the Heidelberg region between 2015 and 2020 while in Cabauw between 2016 and 2018 (Tong et al., 2023), the estimate reached 1.4 mg CH4 m−2h−1 and 0.046 mg N20 m−2h−1 for CH4 and N2O respectively. At Gif-sur-Yvette, neighbouring Saclay, values of 0.8 mg CH4 m−2h−1, 545 mg CO2 m−2h−1 and 0.068 mg N20 m−2h−1 for CH4, CO2 and N2O respectively, were found for the period 2002-2007 (Messager, 2007). In Lopez et al. (2012), N2O values were found for the same site within the range of 0.039 to 0.058 mg N20 m−2h−1 over the period 2002-2011. For CO, Messager (2007) found an average value of 1.46 mg CO m−2h−1 for Europe using measurement from Mace Head, Ireland over the period 1996-2006 with a tendency to decrease over time."

-- The link to the ICOS data given in the data availability statement did not work when I tried.

Indeed, the link seems to have slightly changed, we will correct it with the home page link: https://www.icos-cp.eu/

-- The website for the NOAA curvefit code should be properly cited

We will add the link to the documentation in the Figure 1 caption (https://gml.noaa.gov/ccgg/mbl/crvfit/crvfit.html)

-- The previous Figure 6 seems to have been removed in the revised version but I could not find an explanation in the responses for that. Ther's a statement in the response to reviewer #1 that states a modifictaion of the caption.

Following the second reviewer advice, we decided to show the results using only the properly treated radon data (i.e. with the correction for the time response). This made the Figure 6

superfluous. Contrary to our answer, we however decided against having supplementary materials when revising the manuscript.

-- P12, Lines 29/30 the revised wording "that lead the days to fail to pass the criteria" does not make sense.

We propose the reformulation:

“For this month, the correlation was too low for 19 days and for the other non-selected days, it was either the radon increase or the number of available hours that were too low (below 1 Bq m−3 for the radon increase or less than 2 hours of duration for the available data). “

-- P13/L23: "an underestimation of the inventory for the higher ones" - the revised wording is as unckear as the previous one that the reviewer asked about.

We propose the reformulation:

“The top right panel shows indeed a better correlation between RTM and inventory values for the lower RTM values (< 0.1 mg N20 m−2h−1) but systematic lower values of the inventory compared to the RTM values for the higher RTM values (>0.1 mg N20 m−2h−1).”

-- Reviewer 1 has suggested to provide a seasonality plot, but your respnse does not comment on this suggestion. Could you please provide the plot in your response, even if it does not go into the manuscript?

Figures 11 to 14 were modified so that the left lower panel is showing the seasonality plots.

-- Reviewer 2 suggested Zhou et al 2008 as an additional refernce which is now cited as Zhuo et al 2008. Please double check which spelling is correct.

I got the citation directly from the article publisher and double-checked. It is Zhuo et al.

-- P3/L31: Reviewer 2 asked for an explanation of the ICOS site classes. Why do you state that "only" CO and CH4 are mandatory for class 2 sites? The previous sentence states that class 2 sites have a larger number of compounds required than class 1 sites.

We propose the reformulation:

“For example, CO2, CH4 and CO are mandatory for class 1 while only CO and CH4 are mandatory for class 2. “

--P4/L20: Reviewer 2 stated that the previous wording was not clear regarding where the given range applies to both the observations and further data. The new wording "for the observations made there and for the exhalation maps that used these measurements for verification. " still does not clarify this. Please state the range separately for the observations and the derived maps.

We propose the reformulation

“The values found for SAC for the direct measurements were 18 – 54 Bq m−2h−1. The simulations yielded values in the same range.”

-- Reviewer 2 asked about the mixing ratio/ conentration conversion (referring to P8/L22 ov the first manuscript version). Your response states a corresponding change to the text which I was unable to identify. Please clarify.

We answered that point p6 l6-7: "We use the molar volume at 288.15 K and 101 325 Pa to match the radon data treatment defined in Kikaj et al. (2025)."

-- Reviewer 2 enquired about value of 0.6 for r^2 and how the flux estimates change depending on the cjosen cut-off value of r^2. In your response you refer to a figure added to the manuscript which I could not find in the revised version. Please clarify which changes were mane to the manuscript.

We added Figure 7 in the revised version that shows the radon flux in funtion of the cut-off value.

The figure is commented p10 l6-9: "To check the effect of the chosen R2 cut-off value, we have calculated the average radon flux for each run depending on which R2 cut-off we chose, from 0.4 to 0.8. This is shown on Figure 7. Depending on the R2 cut-off value, the average flux is varying, however, considering the standard deviation, the variations are not significant and confirm that a cut-off value of 0.6 is a good compromise between high correlation and number of events selected."

-- Your response to reviewer 2 states moving content to supplements, however, there is not supplementary information submitted with the revised manuscript. Please clarify.

When we submitted our answers to the reviewers, we were still reprocessing data and not modifying the manuscript alongside the answers. After careful considerations of the reviewer comments, we agreed that the radon "raw" data were not necessary and chose not to include them even in supplemental material.

-- Your response states that code will be made publicly available, however, there is no mentioning of this in the data availability setion of the revised manuscript. Please add.

We are working with the Carbon portal to make the code available. We plan to have the code reachable and usable on the Carbon Jupyter Notebook so it involves several steps. We should be able to provide a proper link before final publication.

-- For the new version of what is now Figure 9, I was wondering if it still makes sense to keep the zoomed out/zoomed in panels in the two left columns. I think one columns with maps of an intermediate zoom level would be sufficient and would simplify the figure.

We can remove the left column to simplify the figure.

-- Figure 10 of the revised manuscript does not have a figure caption.

The caption that is typed in the laTEX file should read:"Soil moisture content for the pixel containing SAC as modeled in GLDAS-Noahv2.1 from 2017 to 2025 with a porosity (noted por on the figure) of 0.439." We will investigate why it does not show in the compiled file.

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