The Global Methane Budget: 2000-2020

Saunois et al., ESSD, 2024

Detailed Response to Anonymous Referee #3 – Review #2

We warmly thank the referee for the time spent on reading and commenting on the paper for a second time. We thank him for his useful corrections and suggestions on the paper, which have helped to clarify and improve the manuscript. Below are the point by point responses (in black) to his comments (in italics, blue). Changes in the text follow each response in bold font.

Thank you to the authors for the changes they have made. I would be happy to see this published. A couple of minor points are below that will need consideration before publication.

On the changed text: "but current emissions appear likely to follow the higher-emission trajectories over the past decade in terms of trend, and the peak year has not yet been reached."

Whilst I'm happy with the sentiment of the change, I'm not sure the new sentence makes sense. I propose something like:

"but current emissions appear likely to follow the higher-emission trajectories, given that over the past decade the trend has followed such trajectories, and because the peak emission year has not yet been reached."

This attempts to correct for, what seem to me, clashing uses of tense within the sentence.

We have corrected the sentence has suggested by the reviewer: "After 2015, the SSPs span a range of possible outcomes, but current emissions appear likely to follow the higher-emission trajectories, given that over the past decade their trend has followed such trajectories, and because the peak emission year has not yet been reached. »

On the changed text: "While the amounts of emissions depend on the surface area of the regions, the relative

contribution of the emissions is much larger (12 points of percent) than the relative importance of the surface areas for the 90°S-30°N region, on the contrary the boreal regions (60°N-90°N) emissions contribute significantly less than the relative importance of their surface areas (9 points of percent)."

I am happy with the sentiment but the meaning of the new text is a bit unclear so I'm going to share how I read it, in case it helps you clarify it.

Firstly, if you are using land surface area as your response suggests, you should say "land surface area" not "surface area", as there is no reason to assume land.

Secondly, It's not obvious to me what's wrong with my interpretation below, but if there's isn't anything wrong, I don't understand how you can have a negative value for surface area percentage for the boreal region.

My interpretation: 90S-30N produces 64% of global emissions. Emissions are 12 percentage points higher than area percentage, so the percent of global land this region represents is 52%? (that's fine by me). 60N-90N produces 4% of global emissions. Emissions are 9 percentage points fewer than area percentage, so the percent of global land this region represents is -5%? (What?!) Please aim to clarify your text so that any error in my interpretation is less likely to be made.

We have clarified this part of the text as follows: "<u>The</u> amounts of emissions depend on <u>the land</u> surface area of the region, <u>however the 90°S-30°N latitudinal band represents 53% of global land</u> <u>surfaces and the boreal region 60°N-90°N around 13%. Hence,</u> the relative contribution of the emissions <u>from the 90°S-30°N region</u> is much larger (<u>11</u> points of percent <u>more</u>) than the percentage of its land surface areas, on the contrary the boreal region (60°N-90°N) emissions contribute significantly less <u>than the surface area percentage of this region</u> (9 points of percent <u>less</u>)."