

Interactive comment on “Regional variation in the effectiveness of methane-based and land-based climate mitigation options” by Garry D. Hayman et al.

Anonymous Referee #2

Received and published: 20 August 2020

Overall, I found the paper “Regional variation in the effectiveness of methane-based and land-based climate mitigation options” interesting and relevant. I have several comments that should be addressed prior to its publication.

Lines 21-24: Why only land-based mitigation and CH₄?

Line 40-43: Add reference

Line 44-45: Add reference

Line 51-54: This sentence as written is confusing. Why are the requirements greater if the literature says they are similar? Are you saying that within the same model and

C1

socioeconomic background land for BECCS is larger in 1.5 than 2C, but across the full literature range 2C scenarios have higher land requirements?

Line 59-60: This sentence should be made more elaborated on or removed.

Lines 255-259: Do you also adjust the energy system or its emissions to account for the reduction in bioenergy?

Line 284: does “preferred mitigation pathway” mean lowest terrestrial emissions or lowest total emissions (including CCS)?

Lines 286-292: Can you determine how much bioenergy (in EJ or Mt per year) you produce from this calculation?

Lines 347-354: This seems repetitive with previous text.

Lines 384-387: This paragraph needs some editing for clarity. The analysis you are doing is focused on the climate sensitivity of mitigation options, not an analysis of their economics or how that would change under different temperature targets. I don’t think you can say that these are “worthwhile mitigation approaches” given your analysis. But, you can say that across the range of temperatures you analyzed there is no noticeable difference in the potential or performance of these mitigation strategies.

Lines 464-465: Why are those regions different?

Lines 468-471: What does “take the water requirements” mean? Do you use the water per unit of output from those studies and apply it to the IMAGE outputs? Or do you use the total water from those studies? If the latter, is it consistent? Also, does this mean you use the RCP2.6 water for the baseline and 1.9 simulations here? Is that water from the IMAGE-LPJmL model (which you note is low) or are you overwriting the IMAGE-LPJmL with the values from those papers?

Lines 472-482: It would be nice to have one sentence in this paragraph reporting the quantitative results before you go through the caveats.

C2

Figure 3: Should the titles of panels d, f, and h say “Carbon Dioxide” instead of “Methane”? In general, I find the naming in this figure difficult since you have 1.5C and 2C on a baseline panel and 2C on 1.5C panels.

Figure 7: Some of the detail in the caption would be good to include in the figure. In particular, the difference between panels a & c OR b & d.

Figure 9: This figure is pretty busy. Do you need the map? Or if you want the map, do you need the colors on the map? It is hard to see the bars and axes.

Interactive comment on Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2020-24>, 2020.