Response to Anonymous Referee #2

PAGE 1

I find this confusing to understand. Note that feedback parameters are a way to show the reponse of the system in a simple way to CO2 and T changes. Given their well known scenario-dependence I am not sure if people use them to find land and ocean C gain back from another scenario. If you are just say that the feeback parameters are different between yours and the standard approach that's sufficient in my view.

Again same thing can go here. Can you highlight examples where people use feedback parameters to calculate emissions?

- *We thank the reviewer for their comment. We have updated the last section of the abstract to make this clearer.*

PAGE 6

This has to mention radiation too.

Please consider rewording this. It's better to say - "radiation module sees a specified time-invariant CO_2 concentration".

- *We have revised the descriptions for the fully coupled, biogeochemically coupled and radiatively coupled modes accordingly.*

PAGE 8

The carbon-cocentration feedback is -ve from the atmosphere's perspective, but positive from the land and ocean's perspective. Please keep this distinction. Here in this sentence you are talking from feedback parameters for land and ocean. That is, beta_A = -(beta_L + beta_O). I see this is done at the end of this paragraph but please mention this earlier.

- *We have clarified the meaning of the feedback parameters earlier in the paragraph.*

This is all very confusing, and the result of expressing change in CO2 concentration related to the peak. If change in CO2 concentration is found relative to PI, then change in CO2 concentration is still +ve until it becomes zero when CO2 gets down to its PI value again. Please consider making this clear that the sign reversal is the result of how you are starting at the peak and not at the PI value.

- *We thank the reviewer for this comment. We have clarified this in the text.*

PAGE 9

Note that in your case, you are not applying negative emissions but rather CO2 concentration is specified.

- *We have corrected this throughout the manuscript.*

Are you assuming that the response of land and ocean doesn't change diagnosed emissions?

These two terms haven't been defined? I am not sure what they represent. (ΔCA (DIFF) and ΔT(DIFF))

- *We have reworked the equations for our novel approach (see Section 2.4.1) to make them easier to understand and follow. We no longer include the terms ΔCA (DIFF) and ΔT(DIFF) in our reasoning.*

PAGE 15

I would rather say "is a combination of the response to both increasing and then decreasing CO2 concentrations" since your simulations are concentration driven and you haven't shown diagnosed emissions.

- *Done.*

This is expected given the time lags associated with cVeg and cSoil

Even if, temperature response were perfectly symmetric we would still see hysteresis due to time lags associated with the turnover time in cVeg and cSoil pools.

- *We thank the reviewer for this comment. We have corrected this in the text.*

PAGE 18

This and several other changes described in C fluxes are hard to follow looking at Figure 7 because Figure 7 shows pools and not fluxes.

- *We have revised most of the manuscript to describe carbon pool changes instead of carbon flux changes so that the text is consistent with the figures shown.*

PAGE 19

Note that these simulations are concentration driven.

- *We have corrected this.*

PAGE 21

~~Approach:~~ replaced with “simulations”

- *Done*.

PAGE 22

I think, you mean mineralization.

- *Done*.

[inserted text: to] due ^ changes in climate alone

- *Done*.