

We thank the reviewer for their positive feedback and helpful comments, which we believe will significantly improve the revision of this paper.

Our responses to comments are in italics below:

General comments:

The paper contributes new, promising findings and methodological frameworks, specifically SOMBA, to account for Enhanced rock Weathering (ERW) rate estimates. I believe this to be an exciting and significant contribution to understanding effective carbon dioxide removal strategies (CDR), given that this was one of the few long-term field studies of five years duration. It also took into consideration both organic and inorganic carbon components. The improved and reevaluated methodology adds value and validity. This looks promising for scaling of new technologies for carbon mitigation in temperate climate agricultural settings.

The methods section is very detailed and long. Given many technical components of data analyses, some ideas could be elaborated, and other sections could be shortened to reduce the length of the methods. Some table captions in the results need re-evaluation. Results can be enhanced with more visual figures. The importance of temporal data assessment of cumulative responses of dissolution and weathering rates are mentioned in different parts of the manuscript, so a figure could be added as a visual graph to demonstrate this and add a clear message in the Results.

We agree that a figure would be helpful, though previously struggled to visualize this in such a way that didn't require an excessive amount of text for explanation. We will try again to find a way to do this in the revision.

Specific comments:

1. Line 143, Section 2.4: what is ICP-OES? It wasn't mentioned before

We will define this acronym in the revision.

2. Line 200, Section 2.6 (or following related sections) could use more explanation on what the different linear mixed effects model designs were. For e.g. In Line 201, name or list the metrics/ parameters for the "measured parameters". Additionally, could show the model equations too.

We will specify the parameters, attempt to clarify the description of the models, and share the code for this analysis in the supplementary.

3. Line 275: Briefly define and fully name “pCO₂”

We will define this acronym in the revision.

4. Line 404: Section 3.5 Results can be expanded. What important implications are construed when the C assessment results are different for "bulk carbon concentrations" vs. "SOC stocks"?

We feel that discussion of implications should be restricted to the discussion, not the results. This has been expanded upon in the first paragraph of section 4.3 of the discussion.

5. Line 457: The language here can be made more accessible for general and interdisciplinary audience by emphasizing how “robust constraints of dissolution” is meaningful, why the different cations matter and eventually connected to weathering. If such attempts were made to explain the concept in previous sections, it can be reiterated in this discussion section for immediacy and clarity.

Thank you for this suggestion. We agree that this relationship should be clear to an interdisciplinary audience, however we feel that the sentences immediately following the cited statement adequately explain why the different cations provide unequal constraints on dissolution and how their depletion is interpreted as a weathering signal. As these concepts are also introduced in the Methods and Results, we have retained the existing wording to avoid unnecessary repetition.

Technical corrections:

- Line 347: Table 3 description mentions “Ti” but is not actually listed in the table.

We will correct this in the revision.

- Line 390: Table 5 description could state or spell out what the three different variables pH, %C and C(t/ha) exactly are in brackets.

We will correct this in the revision.

- Line 412: “Mean SOC stocks increased from 45.3 t C ha⁻¹ in control plots to 50.3 t C ha⁻¹ in treated plots,”
 - Consider restructuring the sentence to say that treated plots had higher mean SOC stocks than control, not that SOC increased from... to This makes it sounds like the control and treated plots are compared to each other as before and after

We will make this change in the revision.

- Line 457: “these” should be replaced with “the” as it is the first sentence of a new paragraph

We will make this change in the revision.