

# Organization

- Lines 327-30: This sentence should be moved to the end of the paragraph at Line 276.
- Lines 357-64: This should be its own paragraph.
- Lines 366-72: The information here should be moved to a new paragraph after the paragraph ending Line 276.
- Lines 392-400: Because the calibration and validation gave largely the same results in terms of best-performing model, this description of the calibration set metrics can probably be removed to simplify the paper a bit.
- Line 419: Sect. 3.1.2 label should say "analyses" (plural) instead of "analysis" (singular).
- Lines 420-427: There are three analyses whose results are described in the three sentences of this paragraph. That's confusing! They should each be their own paragraph—or, ideally, subsection (3.1.2, 3.1.3, 3.1.4). This will allow you to dedicate more space to them, explaining what they mean for subsequent analyses you will present.
  - At the beginning of each, remind the reader what the purpose of the analysis was, and add parentheticals referring back to the Methods section where it was described.
  - Lines 423-5: This should be moved to Sect. 3.1.2 and given its own paragraph (and expanded).
- Lines 435-7: As with lines 392-400 (see above), this description of the calibration metrics can probably be removed.
- Lines 444-6: This should only mention results from the validation dataset, not the calibration.
- Lines 448-50: As with lines 392-400 (see above), this description of the calibration metrics can probably be removed.
- Lines 468-72 (Fig. 7 caption): To make it easier for the reader to understand the differences between this and Fig. 6, simplify by just saying "As Fig. 6, but for models based on MIMICS\_TSMb instead of MIMICS\_T." You can make similar changes for supplemental Figs. S11 ("As Fig. 6 but for calibration step instead of validation") and S12 ("As Fig. 7 but for calibration step instead of validation" and/or "As Fig. S11 but for models based on MIMICS\_TSMb instead of MIMICS\_T").
- Figs. 8, S14:
  - Is there a difference between these other than S14 being short-term and 8 being long-term? If not, simplify the caption for S14 by just describing its difference from 8.
  - Why does Fig. S14 have a row for  $\Delta$ SOC but Fig. 8 doesn't?
- Lines 493-9: This should be a separate paragraph.

## Misc.

- Sect. 3.1 is titled "Performance of different MIMICS versions for simulating cropland SOC". However, it only has results for MIMICS without biochar. It should be renamed to reflect this.

- Line 297: "New-Ralphson" should be "Newton-Raphson" (note, no L).
- Lines 349-50: This sentence just repeats (in different words) the sentence at Lines 350-2, right? Suggest deleting.
- Lines 352-6:
  - This would be much easier to read as a numbered list with line breaks.
  - (3) can be more concisely rewritten by describing only its differences from (2).
  - (4) can be more concisely rewritten by describing only its differences from (3)
- Line 362: "MIMICS-T that have" should be "MIMICS-T, which had".
- Lines 365-72: Explain why this test is being conducted. I.e., why is it a problem that most biochar addition experiments are short? What additional value will you gain from the long-term experiment described here?
- Line 376: "availability carbon" should be "availability of carbon"
- Line 377: What was the original value of  $f_{ba}$ ?
- Lines 378-9: What does "the partitioning coefficient of  $f_{bp}$  and  $f_{ba}$  were optimized to evaluate the model performance" mean? Didn't you just say  $f_{bp}$  was set to 2%?
- Lines 379-81: Were the sensitivity tests here conducted in a factorial way? Or did you only perturb one parameter at a time?
- Lines 404-6: Put "Compared to MIMICS-def" at the beginning of this sentence (and delete the similar phrase at the end). Putting that information at the end makes the sentence hard to understand at first.
- Lines 410-2: Does MIMICS not represent the effect of flooding on SOC decomposition? This is implied but not actually said.
- Lines 414-8 (Fig. 4 caption): Mention that values for the bar graphs in Fig. 4e can be found in Fig. S5.
- All scatter plots: Best-fit lines should not extend beyond the lowest and highest X-axis values of the data points.
- Lines 455-6: "Among the different MIMICS\_TSMb-BC versions, MIMICS\_TSMb-BCDV shows the best performance (Fig. 7)." It does have the best R<sup>2</sup>, RMSE, and AIC, but its slope is much farther from 1 than either BC\_DV or BC\_DV-SOCa. If I were considering adopting one, I would choose one of the latter, which makes me think those are "better."
- Line 475: "or" should be "and".
- Lines 479-80: But increases (introduces) bias related to SM.
- Line 493: Delete "that".
- Lines 543-4: This sentence mentioning the work of Juice et al. (2022) doesn't seem to contribute anything. What did they find?
- Line 568: Incubation has not been previously mentioned; please define.
- Line 573: "In the MIMICSTSMb-BC versions that include the adsorption process" should be changed to "In the MIMICSTSMb-BC versions, which include the adsorption process".