The underlying modeling work has merit as an exploratory analysis of pristine peatland vulnerability to drainage. The framework is interesting, the topic important. The authors have made important improvements since Round 1, including a vegetation sensitivity test, and an expanded discussion of limitations. I appreciate these additions, particularly the improved Discussion section which shows good transparency about model constraints and the Abstract which appropriately acknowledges limitations (lines 41-44).

However, the main concern from Round 1, about applying the model beyond its calibration range, is in my view still not adequately reflected in how the results are presented. While the Discussion shows good awareness of limitations, I think the Conclusions do not reflect the same care. This creates a risk that readers will see the results as validated predictions rather than exploratory scenarios.

Major Comments

1. Lack of uncertainty quantification in results

All figures show only single lines without uncertainty ranges, even though the authors used ORCHIDAS, a Bayesian method (lines 186-189) that gives uncertainty estimates from the calibration. The sensitivity analysis shows how different sites respond differently, but this is not the same as showing the uncertainty around any single site's projection.
More importantly, Appendix D shows that different vegetation assumptions can completely reverse the climate effect, from cooling to warming or the opposite (lines 615-616), yet this critical uncertainty is not shown in any main figure. Without showing uncertainty, the results look more certain than they really are.
Please add uncertainty bands to all projection figures and mention uncertainty bands in the text, e.g. in section 3.8. These could come from the Bayesian calibration and should also show the range across different vegetation scenarios from Appendix D.

2. Temporal validation limits not made clear in conclusions and results

The Conclusions should clearly state that validation covers the first 10 years and that longer projections are model extrapolations with growing uncertainty. This does not mean you need to remove the long-term results, but they should be presented as exploratory scenarios rather than validated predictions. For example, the statement about how "longer drainage period leads to diminishment of CO_2 emissions" (lines 675-678) goes beyond what has been validated.
Also in the results part, I feel like this is not mentioned clearly enough. For instance, the caption of Fig. 6 does not mention at all that it is only showing simulated fluxes after 10 years of drainage. I feel like this is an important information. Same for Fig. 7, 8 and 9. Furthermore, the emulator model depends on this sensitivity analysis of the first 10 years after drainage. This does not come out

clearly in the text. Also in the conclusions, please mention that the emulator model is based on the sensitivity of GHG emissions to water table depth after 10 years of drainage.

3. Claims about net climate effects need careful rewording

Conclusion 5 (lines 691-695) states that drainage causes "net cooling" using GWP20 and provides "a more nuanced view than the current paradigm." While you acknowledge this "seems at first glance opposite to meta-analysis results," I think this part should be softened to not appear to overturn well-established findings without strong validation, especially since the net cooling depends on projections that go well beyond the 10-year validation period.
Furthermore, Appendix D shows vegetation scenarios can reverse the sign of climate effects, and even though it is mentioned in the Discussion (lines 606-616) and is absent from the conclusions. The Conclusion only notes "future work should consider" this (line 703). However, current conclusions about net climate effects already depend on vegetation assumptions. Relegating this to future work is insufficient when the baseline scenario lacks empirical justification.
The authors should either provide evidence for why the baseline vegetation scenario is realistic, or present the main results as an ensemble across the vegetation scenarios explored in Appendix D. At minimum, the conclusions must acknowledge that vegetation uncertainty can qualitatively change the climate impact assessment. This is not a minor sensitivity, because it affects the sign of the main finding.

Minor Comments

4. Figure captions need more detail

Several figure captions lack important contextual information that would help readers interpret the results, as already mentioned above. Another example is Fig. 6 where the validation data are from Evans et al. (2021) are not mentioned in the caption.

5. Statistical emulator presentation

The emulator (Section 3.7) is trained on model outputs with acknowledged limitations using a small sample size (10 sites, 6 predictors, acknowledged multicollinearity). While the Abstract appropriately uses cautious language ("may offer a simplified tool," lines 43-44), the authors should consider whether this tool requires more extensive validation before presentation, or whether it should be more explicitly framed as exploratory given the acknowledged limitations of the underlying model.