

Response to Anonymous Referee #4

The author has finally done what I was asking for: a "back-of-the-envelope" carbon budget (shown in table 1) that explicitly explains how his hypothesis can be reconciled with the isotopic data. Of course these numbers could be discussed lengthily. In particular, the author's hypothesis is requesting a very strong shift in C3/C4 plants that more than overcompensate the oceanic ^{13}C changes, something that I have difficulties to buy. Still, the whole discussion being presented as an hypothesis, I think this paper is now acceptable.

The paper is also requesting that the glacial ocean carbon content was significantly larger (+520 GtC) and the terrestrial carbon significantly smaller (-920 GtC), which are both indeed key to explain lower glacial CO_2 and oceanic ^{13}C changes. I am therefore not entirely satisfied with sentences like "This work enunciates the possibility of kerogen oxidation as a major driver of atmospheric CO_2 increase in the wake of glacial episodes" (abstract) since a large part (and in fact the most critical parts) of the carbon changes shown on table 1 are not linked at all to kerogens...

Anyway, as explained in the author's response: "this contribution is an "Ideas and perspectives" article. A perspective is always biased..."

I might agree with that to some extent, but I still would prefer a more balanced discussion.

Dear Reviewer,

Thank you very much for your feedback. I agree with your point and have therefor set emphasis on these other major processes in key parts of the text. Now, in the abstract, explicit reference to "... major oceanic degassing and biospheric regrowth..." is included and in one of the concluding paragraphs stronger wording is used to emphasize "...Earth system constraints such as the carbon isotope record dictate that other major processes must have acted." Also, the numerical output of the back-of-the-envelope calculation is now explicitly expressed in words in section 2, underscoring the necessity of multiple major sources and sinks working in tandem. Additionally, the abstract now includes explicit reference to the C3-C4 shift, which is certainly an interesting corollary from the isotope mass balance. Furthermore, the caption in figure 3 was edited to emphasize the major contributions of biospheric regrowth and ocean-air gas exchange to global biogeochemical cycles over the glacial-interglacial transition. Overall, the abstract, conclusions, figure caption of Fig 3, and the beginning as well as the end of discussion in section 2 provide high-visibility points emphasizing the necessity of multiple major carbon cycle drivers in the context of the kerogen oxidation hypothesis.

Thanks to your thorough and persistent feedback, this contribution has reached a level far higher than I could have imagined. This contribution together with the discussions resulting from this peer review process I am convinced will make for a stimulating resource of Ideas and Perspectives.

Sincerely,

Thomas Blattmann

06.12.2021 Zurich