

Earth Surf. Dynam. Discuss., referee comment RC2
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Comment on esurf-2022-26

Sophie Hage (Referee)

Referee comment on "Yukon River incision drove organic carbon burial in the Bering Sea during global climate changes at 2.6 and 1 Ma" by Adrian M. Bender et al., Earth Surf. Dynam. Discuss., <https://doi.org/10.5194/esurf-2022-26-RC2>, 2022

General Comments

It was a pleasure to read the study by Bender et al. who provide a new understanding of particulate and carbon export from the Yukon River to the Bering Sea, using 1) newly dated terraces along the Charley River, a tributary of the Yukon River; 2) previous work published by the same authors. The authors identify a link between Yukon River incision/export, Bering Sea sedimentation and climate, likely explaining CO₂ drawdown across the Pliocene/Pleistocene and mid-Pleistocene. The study is timely and will be of interest to a wide range of scientific communities. The paper is clearly written and concise, yet it lacks a bit of context in a few places (although I acknowledge that most of the context is provided in cited references). I find that the paper message is well documented by four clear figures (and a few useful pictures in the appendix). I have a few specific comments that may help improve the clarity of the paper.

Specific comments

- **INTRODUCTION:** Please state the objectives of the paper more clearly at the end of the Introduction. This can be done in one sentence or two. It will help the reader to see the scope and context of the study upfront. In particular, it seems odd that neither the Yukon River, nor the Bering Sea are mentioned in the Introduction. A bit more context is needed as to why these settings are worthy of investigation.
- **METHODS:** It would be useful to describe the aims of each of the methodological approaches carried out. How does ²⁶Al/¹⁰Be isochron burial methods work (in a few words)?
- **Line 90:** I feel that the final findings of the paper are announced too early here
- **Line 153:** How did you quantify that 85 % of the organic matter is of marine origin? Was a mixing model used? Can it be shown/expanded in the text?

Technical corrections

Lines 101-102: Can you reword this sentence?

Lines 120-123: "We designed our sample strategy to directly compare results with the previously developed Fortymile River terrace chronology (Bender et al., 2020), sampling three sites along T1 (Figs. A1–A3) to test whether the terrace age decreases upstream and one T2 site (Fig. A4) to test whether the terrace age overlaps the 0.7–1.2 Ma mid-Pleistocene climate transition as observed along the Fortymile River."

--> This sentence is hard to follow (e.g. "test whether" is used twice). Can you simplify?

Line 130: remove "d" from "measured"

Line 134: add "use" between "We" and "the"

Line 147: What does "ages up to 4.3 Ma of %TOC" mean?

Lines 182 to 185: "Charley River terrace tread heights reflect incision depth, and burial ages date last fluvial deposition and thus, approximately, incision onset; these data imply that incision advanced ~140 km upstream at ~160 mm kyr⁻¹ from 2.2 to 1.6 Ma, stalled during 1.6 to 1.1 Ma as T2 aggraded, and resumed at 1.1 Ma"

--> Can you simplify this sentence? Split in two parts?