

Comments from Reviewer 2

We would like to thank Reviewer 2 for their insightful comments that helped us improving our manuscript. Below, we provide a point-by-point response and describe how each comment has been addressed in the revised version.

- 1) Please revised the Key point #1 into “Even inconspicuous hydrocarbon seepage in organic-poor sediments modifies redox zonation, a novel insight for low-flux systems in glaciated shelves.”

We agree and revised Key Point 1 accordingly. The updated wording emphasizes the novel impact of low-flux seepage on redox zonation while maintaining broad applicability. It now reads as: “Even inconspicuous hydrocarbon seepage in organic-poor sediments modifies redox zonation, highlighting previously unrecognized biogeochemical sensitivity in low-flux systems.”

- 2) Lines 242 after “..... ultrapure HNO₃.”, Please add “Acidification was performed immediately prior to HR-ICP-MS analysis to minimize metal loss.”

We agree that the timing of acidification should be clarified to avoid ambiguity. The sentence has been revised accordingly and now reads: “Cation and trace elemental concentrations in the pore water were determined using high-resolution inductively coupled plasma mass spectrometry (HR-ICP-MS, ELEMENT 2XR, Thermo Scientific, Waltham, USA) at the ElMiE-labs at GFZ after acidifying the samples with ultrapure HNO₃ immediately prior to analysis.”