Reviewer 2

Schnabel and co-authors explored the impact of minor HC seepage on sediment sulfur cycling through generating a variety of datasets, including porewater geochemistry, reaction rate calculation, metagenomic and metatranscriptomic data. I admit that considerable efforts have been made to collect so many sediment cores and produce such comprehensive datasets. However, the present paper fails to formulate an informative and sound story; it reads more like a report rather than a scientific article. With that said, the data have not been deeply digested and synthesized. As a non-expert on microbiology, I can see that the microbiological data seem not to be well utilized and explored. The other flaw lies in the very limited novel perspectives provided by this study.

Answer: *We would like to thank the Reviewer for spending time and effort into revising our paper. We agreed to most of their suggestions to improve the paper.*

Here, we provide point-by-point responses to the Reviewers' comments. Original comments by the Reviewer are listed in regular font while our answers appear in italic font.

Specific comments

1. The title reads a little confusing. I don't see any discussion on the implication for HC reservoir detection.

Answer: *This topic was the initial driver for the study. We removed the second half of the title as we agree that the implications for HC detection are not discussed in detail.*

2. The Abstract is a little verbose; it is usually limited to one paragraph.

Answer: *The Abstract was condensed but we kept using paragraphs in the abstract as they make it easier to understand the content. Using paragraphs is not forbidden according to the journal's instructions to authors.*

3. HC positive site? How about HC bearing site?

Answer: *We changed all to HC sites.*

4. Line 94: The depth of SMTZ at ~100 m in the continental margin sediments is uncommon.

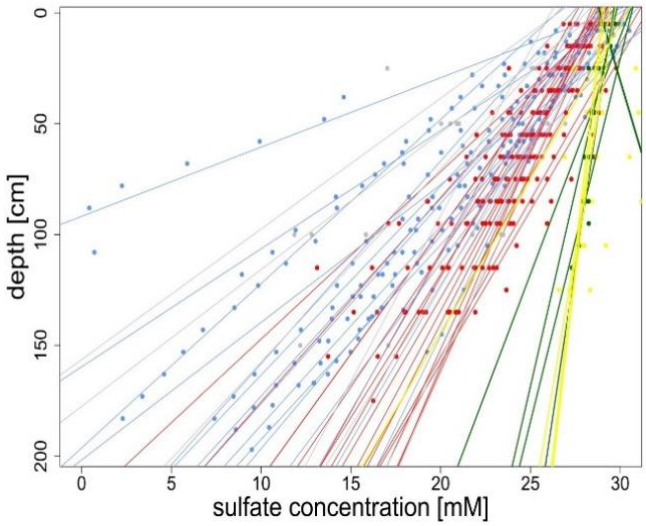
Answer: *This is right. It is the maximum depth and not the general depth. We revised the sentence.*

5. Line 154: what molecular analyses?

Answer: *Molecular analyses were specified as DNA/RNA in the text.*

6. Figures 2&3: I would suggest plotting the measured data instead of the extrapolated profiles. Maybe pick several representative profiles rather than the whole dataset.

Answer: *We have combined Figures 2, 3 and 4 and added some representative profiles to a new figure to show that the linear regression is justified. The new figure was implemented to the main text (Fig. 2). We believe that the trends we report in the main text can be captured much more quickly by depicting regression lines plotted jointly. We have also plotted the data points together with their regression lines, but the resulting plot appears too busy and one can no longer tell the individual cores apart (see plot here under).*



7. Figure 4 can be combined with Figures 2&3.

Answer: *Done accordingly.*

8. Figure 6. As CH4 and CO2 are not key data and they are subject to sampling artefact, they can be moved to the supplement.

Answer: *We beg to disagree with the reviewer as we feel that these data are necessary to put the other data into a context. For example, the very low methane concentrations clearly indicate that AOM is not a relevant process over the cored depth intervals*.

9. Line 448: Higher occurrence? Weird wording. Also I don't see higher sulfate reduction rate in the deeper sediments from Fig. 5.

Answer: *There is a misunderstanding here. SR occurs more frequently at greater depths, but the sulfate reduction does not show higher sulfate reduction rates. We have reworded the sentence to avoid misunderstanding.*

Line 508: No sulfate profile in Figure 5.

Answer: *The wrong figure was mentioned. Corrected*

10. Line 514: It is more likely that the lower alkalinity flux is attributed to HCO3- removal by authigenic carbonate precipitation, which can be demonstrated by Ca and Mg data if they are available.

Answer: *We assume that carbonate ions are originating from AOM at greater depths, diffusing upward and eventually precipitate as calcium carbonate. However, given the sulfate concentration profiles and the scarce methane data, it becomes clear that AOM is not a quantitatively important process in the cored depth interval. Also, the low level of detection of transcripts related to AOM suggest that the imprint on the geochemistry is minimal to non-detectable.*

Line 523: I think the latter hypothesis is more likely. I doubt the reoxidation of sulfide can contribute large variation of sulfate flux. My understanding is that sulfate derived from the reoxidation of sulfide is rapidly used via sulfate reduction rather than remaining in the porewater.

Answer: *We agree that the latter hypothesis is more likely, but believe that both hypotheses have their justification, nonetheless. We discuss both hypotheses now.*