

## ***Interactive comment on “Seafloor observations at Campeche Knolls, southern Gulf of Mexico: coexistence of asphalt deposits, oil seepage, and gas venting” by Heiko Sahling et al.***

**Heiko Sahling et al.**

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Point-by-point comment to Referee #1

Referee #1: My main points are that the abstract needs to be shortened and made more concise. And there are some aspects of the discussion, particularly related to the biological communities, should be modified according to my specific comments below. Additionally, I suggest some minor grammatical modifications. My specific comments follow below: Title: No mention of the chemosynthetic fauna, yet they are a central part of the results and discussion. Why?

Reply: We changed the title to: “Massive asphalt deposits, oil seepage, and gas vent-

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ing support abundant chemosynthetic communities at Campeche Knolls, southern Gulf of Mexico”

Referee #1: Abstract: It strikes me as too detailed. It needs to be streamlined to summarize the key points, and lose some of the detail. Also, the order of topics (method employed to data acquisition, habitat, community, gas composition, gas emission, hydrate and fauna, summary) is somewhat chaotic and could be reordered and better integrated to make the information smoother. Also the part of the final sentence on "species new to science" is unsubstantiated, not discussed elsewhere in the paper and should be deleted.

Reply: We have rewritten the abstract following the recommendations.

Referee #1: Introduction: para 3: "scuba-diving depths" is subjective. What is it, 30m?

Reply: Correct, it was at 30 m water depth, we changed the sentence accordingly.

Referee #1: Introduction: para 3, last sentence: on oil exploration. This sentence is not really part of the paragraph or the paper and should be eliminated, or developed more fully.

Reply: We deleted the sentence.

Referee #1: Methods, para 2: Please provide the exact dates for cruise M-114. Same for Table 1 (see comment below).

Reply: We included the dates of the cruise in the text and included the dates of all stations conducted in Table 1.

Referee #1: Results 4.1: Paragraph 2. The backscatter profiles that you show, and the situation you discuss related to its appearance in only part of the water column can also be due to currents. If this is the case, then linearly projecting the flare from mid-water to the seabed may be biased. You might want to at least mention this.

Reply: We have re-written the paragraph and now describe in more detail how flares

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were traced through the water column analyzing swath by swath manually. Such three dimensional analyses allows to trace the flares through the water column although deviated by currents. We are therefore confident that the fact that flares only appeared above the seafloor in the echosounder records are not due to currents.

Referee #1: Site Description 4.2.1: replace "in the following" with 'hereafter'

Reply: Done.

Referee #1: 4.2.2. The term "decimeter" while not incorrect, seems somewhat awkward to me. Perhaps consider replacing it with or tens of cm??? Sorry if this seems nitpicky, and I am certainly willing to yield to the editor on this if we differ in opinion.

Reply: We changed the phrase giving the more accurate numbers "10 to 30 cm in height".

Referee #1: 4.2.3. In the mention of the bivalves and other fauna found here, was there any collection made for analysis of these organisms?

Reply: We included two sentences in the Material and Method section indicating that biological samples were taken but that the taxonomic identification is far from being complete.

Referee #1: 4.3. Were the camera sled observations from previous cruises included in this paper? It seems ambiguous.

Reply: Yes, we used camera sled observations from previous cruises and included the information explicitly into the result section.

Referee #1: Discussion, 5.1, para 2, sentence 1. "While prior: : ." Awkward wording. Reformulate.

Reply: Done.

Referee #1: Discussion, 5.1, para 3, sentence 1. Camera sled surveys. It is unclear to

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me what data the camera sled surveys have added to the present manuscript.

Reply: The camera sled surveys as summarized in Table 1 double the locations with evidence for hydrocarbon seepage at Campeche Knolls as shown in Figure 2. It supports the fact that this particular form of hydrocarbon seepage with asphalt deposits at the seafloor is not limited to the sites described in detail by ROV but are more wide spread and, thus, an integral component of seepage at Campeche Knolls. The importance of such observation has also be emphasized by Referee #2 that is why we left these information integrated into the manuscript.

Referee #1: Discussion, 5.1, para 2, sentence 1: "proven for". Revise as "visually identified at"

Reply: Done.

Referee #1: Sec 5.3: find and fix spelling error "alcalinity"

Reply: Done.

Referee #1: Sec 5.3. ": :we speculate that gas seepage at our study sites was stable on time scales of hundreds of years: : ". Be careful here. I see your point and will not wholly disagree, but the only chronometer you are invoking are vestimentiferan "estimated" lifespans from a completely different location. Further the Bergquist method of aging was not unequivocal, so be a little careful here.

Reply: We re-phrased the paragraph concerning the use of vestimentifera as chronometer and are more careful about its validity.

Referee #1: Sec 5.5: many mentions of bacteria: "methane oxidizing bacteria", chemosynthetic bacteria". Unless the authors are sure, these microbes could well be archaea. I suggest using "microbes" instead, or specify if they are archaea or bacteria.

Reply: We refer to publications that have studied the microbes and identified them as bacteria, so we left the section unchanged.

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Referee #1: Sec 5.5: (final paragraph): "Preliminary interpretation of our observations suggest that the species diversity is higher in the oil seeps that at other sites..." This statement is premature and unsupportable in its present form. If the authors think that this may be the case, it would be easy enough to quantify with a proper analysis of species present and their abundances. Either do a proper analysis, or drop this statement.

Reply: We omitted the statement.

Referee #1: Sec 5.6: This entire section has several problems, and could, in my opinion, be eliminated. It really is reaching outside the core story and does not add to the central thesis of the paper. The first paragraph on biogeography and teleconnections between Campeche Knolls and other deep-water seep systems, particularly the Florida escarpment, is very speculative, and based on only the thinnest of observations from this study. In fact, as mentioned earlier in my review, the analysis of the benthic community, species present, and community structure, and diversity is not very well developed. A lot more formal analysis could be made of the observations of the community characteristics. Lacking that, this paragraph is unwarranted. The second paragraph on anthropogenic impacts of the benthic community is not germane to the story and can be eliminated in its entirety. The final paragraph on advocating for a priori protection of these locations in any future oil exploration is really advocacy, and not basic science. In my opinion, this is out of scope and should be deleted (the parts of the abstract and conclusions regarding this should also be modified accordingly).

Reply: We agree that the paragraph has several problems and deleted the entire section.

Referee #1: Conclusion: Typo: 'reanalyzes' = reanalysis

Reply: Done.

Referee #1: Last sentence, first para: Delete this sentence. Not a main conclusion,

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and no direct supporting evidence.

Reply: Done.

Referee #1: Last sentence, second para: "over time spans of hundreds of years". Really no direct evidence for this. Change to "over extended timespans"

Reply: Done.

Referee #1: Last sentence, final paragraph: "We call for protective: : :" Advocacy. Delete (see also comment above).

Reply: Done.

Referee #1: Figure 4A. There is no box shown.

Reply: We changed the color of the box to become more visible.

Referee #1: Figure 9A. There is no box shown.

Reply: We changed the color of the box to become more visible.

Referee #1: Figure 11. Cannot see the ROV dive tracks. Possibly the image is too dark.

Reply: We changed the color of the dive tracks to become more visible.

Referee #1: Table 1. Put the stations from the current cruise first (not last). Also add dates for the AUV or ROV dives or other observations. Also, place depth of each location in a separate column.

Reply: Done.

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