The manuscript presents an interesting dataset consisting of GDGT data and archaeal composition based on 16S rRNA, where it investigates if significant differences can be observed between sediment cores that were taken from pockmark sites versus those taken from reference (non-pockmark) sites. Thereby, the study explores if certain GDGTs could be used as proxies for methane seepage or SGD.

General comments

- As noted by the authors in the introduction, pockmarks can be both active and non-active. Apart from Supplementary Table 1 where a qualitative description is given for the sites, quantitative constraints to what extent the pockmark sites display porewater freshening, SGD, methane ebullition or dissolved gas seepage are lacking. Furthermore, as it seems that some of these sites have been investigated previously, it would benefit the study if some data is presented to confirm the duration of methane seepage or SGD over the years. Such porewater chemistry data is rather essential to support statements in the manuscript such as "which may reflect the dynamic geochemical conditions characteristic of these gas systems" (line 698), "likely result from SGD-marine water mixing within a shallow redox-transition layer" (line 822), "Results suggest that submarine groundwater discharge and pockmark activity drive geochemical conditions and microbial distribution." (line 876) and "site-specific hydrographic conditions associated with SGD" (line 885).
- There seems to be an inconsistency on a few occasions where SGD is used interchangeably to describe fSGD, while in lines 82 to 84 it is acknowledged that SGD can be both fresh or saline (which I fully agree with, although it is naturally a matter of definition). An example is: "SGD alters porewater chemistry through decreased salinity and chloride depletion" (line 98), which would imply that SGD is always fSGD.
- In the introduction both SGD and methane seepage are discussed and the processes are described. When moving into the GDGT section of the introduction (lines 107-163), only methane and nitrate related GDGTs are described and SGD is disregarded. Is there anything known from literature regarding SGD-derived or influenced GDGTs? Or is there any hypothesis how SGD may impact GDGT presence? If little is known, it would be good to specify that, which only strengthens the motivation for the study.
- To what extent do the authors think that the considerable variability and lack of compositional differences (as described in Figure 3) can be explained by accounting for present-day porewater chemistry. For example, reference sites might experience methane production and seepage without pockmark formation, and pockmark sites might have been inactive for a long time. Do significant differences arise when active vs non-active seepage sites are compared?

Specific comments

- "Freshwater infiltration" (line 32); I suggest to replace this with freshened porewater discharge, freshwater presence or an equivalent, as freshwater infiltration could be interpreted as freshwater infiltrating from the water column down into the core.
- Line 60: remove "worldwide".
- Line 60: Lithosphere could imply that pockmarks can also be formed in non-sediment parts of the lithosphere. Would be more specific here, e.g., use "sediments".
- Line 62: "fluid emanation"; perhaps clarify that pockmarks can be formed both due to fluid seepage as well gas seepage?
- Line 68: Suggest to replace "Fluid types" with methane sources or something equivalent.

- Line 83: Replace “freshwater groundwater” with freshened groundwater.
- Line 90: “(from initiation through expansion to stabilisation)” it is unclear to me what the authors intend to say here.
- Line 94: “Under such conditions” the causal relation between these two sentences is unclear to me. Can the authors elaborate on the link between sediment trapping, porewater freshening and shallow methanogenesis?
- Line 188: I suggest to replace “methane bubbling” with methane ebullition.
- Lines 364-366: report the STDV along with the median and means.
- Line 373: “When normalised to TOC”; which TOC? The LOI-derived TOC?
- Line 373: To what extent (quantitatively) is elevated summed iGDGT explained by elevated TOC contents in general?
- Figure 2: i) To facilitate easier comparison of the different cores please use the same ranges and ticks for the x-axes wherever possible without loosing the downcore trends. ii) For the MET3 TOC figure, why is there no line for the pockmark datapoints? iii) Please elaborate on the error ranges or uncertainties for these plots. iv) In the figure caption “TOC concentrations are consistently elevated in pockmark sediments” > this does not seem to be true for MET3. v) Put the MET1-BH iGDGT plot y-axis to 95 cm to keep it consistent with other subplots.
- Table 1: If I understand correctly, these GDGT-based indices are downcore means per core. If that is the case, please also report the STDEV or something similar to demonstrate the variability.
- Line 473, 528 and throughout manuscript: “sediment types” the phrasing of sediment types may be misleading, I suggest to be specific and say “between pockmark and non-pockmark cores/sites” or anything equivalent.
- Line 571: “methane-bearing sediments (pockmarks)” > is it confirmed that all pockmark sites have active methane seepage? Similar comment for line 613 “methane-rich sediments”.
- Line 637: “in the absence of fluid seepage”, do the authors refer here to methane seepage or SGD?
- Line 653: “which are characterised by strong SGD” > add reference.
- Line 666: “pockmark MET4 is characterized by low-intensity SGD” > add reference.
- Line 679: “the MET3 and MET4 study sites were characterised by stable, non-ebullitive methane emissions” > add reference.
- Line 680: “which could have contributed to the better preservation of iGDGTs” can the authors elaborate on through which mechanism?
- Line 765: “the inactive pockmark P/MET3” and “low-SGD pockmark MET4” > add references.
- Line 834: “advective flushing sediment layer” it is unclear to me what the authors mean here.
- In Supplementary Table 1 it seems that a decrease in chloride is used as an indicator for SGD. Are these profiles diffusive or advective? And for the sites with no porewater freshening, does saline SGD occur? Even in the absence of freshwater, advection of saline porewater could still have an important control on the depth of different redox zones, and thus archaeal composition.

Technical corrections

- Lines 648, 651, 674 > reference sources not found
- Line 705: Table number is missing.