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Biogeosciences Discussions

Interactive comment on "Biogeochemical processes and microbial diversity of the Gullfaks andTommeliten methane seeps (Northern North Sea)" *by* G. Wegener et al.

Anonymous Referee #2

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General comments:

This paper reports on the characterization of two active and accessible seepage areas, Tommeliten and Gullfaks, in the Northern Sea using geochemical and molecular tools (specific biomarker and carbon isotope signatures, 16 S rRNA gene sequences, CARD-FISH). The microbial results were compared with those of known deep water cold seep communities to investigate whether shallow and deep seeps are populated by different types of methanotrophs.

The anaerobic oxidation of methane is a dominant process in gassy sediments. One research area tries now to estimate the microbial filter efficiency against methane from

regional scales up to the global scale. Thus, we need a deeper understanding of the diversity of the microbial consortia involved in AOM and the underlying geology, which determines the methane fluxes.

The main findings of this paper were that the different permeability of the seabed at both seep sites appeared to affect the efficiency of the microbial filter against. Bacterial mat covered sediments were populated by active communities of ANME-2 and sulfate reducing partners, which were depleted in 13C indicating the assimilation of methane derived carbon. Many sequences of the clone libraries were related to sequences of deep cold seeps indicating that water depth or other oceanographic conditions are not limiting their dispersal. However, the mat covered surface sediments were dominated by ANME-2, whereas the subsurface sulfate methane transition zone was dominated by ANME-1. The authors concluded that different energy availabilities may select for different methanotrophic communities.

The study comprises an extensive data set, which is well analyzed. Nonetheless, the manuscript is rather lengthy and wordy (44 pages), mainly descriptive, and contains numerous redundancies that could be easily avoided. Descriptions of the sites should not be repeated in the Results section. Sentences which draw the attention of the reader to tables or figures without any further information can be easily deleted (e.g. Page 986, L. 8-9). I was confused by the mixed Results and discussion section, because the Tommeliten area has been studied before in detail (Niemann et al., 2005), and it was not easy to differentiate between new and old findings from other groups (Page 986-988). The conclusion section is not necessary, because it is more or less only a summary (similar to the abstract). There are only two real conclusions in the last sentences. Thus, I would strongly suggest to condense the manuscript to 35 pages, and to highlight on the results of this paper.

B. Individual scientific questions/issues.

Page 989, L.1-9: What is the standard deviation of the DAPI counts? Is a decrease

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form 7.9 x 109 to 1.3 x 109 really a considerable decrease?

Page 989, L. 10-11: The detection efficiency of CARD-FISH is very low. Can you comment on these low numbers?

C. Technical corrections: Page 978, L. 12: Please use small letters (sulfate). Page 979, L. 2: Please check the numbering of the equations. Page 987, L. 12: Delete likely. Page 996, L. 13: Change rDNA to rRNA.

Interactive comment on Biogeosciences Discuss., 5, 971, 2008.