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Comment

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

**Anonymous Referee #1**

Received and published: 11 April 2008

A.- An initial paragraph evaluating the overall quality of the discussion paper ("general comments")

This paper becomes to demonstrate the importance (previously suggested) of seabed fluid flow for marine environments and climatic change. Thus, it represents a notable contribution to understand the complex biochemistry of marine seeps containing methane. Although methane seeps are essentially geological processes, really they also affect marine ecology, ocean chemistry and atmosphere composition.

The paper clearly shows that seabed is not the limit of the marine system. Contrarily, a number of variables and geological features (sediment composition, interbed-

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ded lithologies, etc) are operating under the seabed, resulting in different gas escape conditions that will modulate the microbial populations, which are the base of marine ecosystems.

I may consider a relevant contribution the results reached by fatty acids analysis. The authors present here one of a few studies able to demonstrate that partial assimilation of methane from seeps occurs by sulphate reducers involved in AOM. Determinate the consumption of methane by microbial activity may be a necessary previous step for the determination of the methane fluxes towards the hydrosphere and atmosphere.

Due to the considerations above, I think that the present paper address relevant scientific questions, which may be of interest and within the scope of BG.

It is a main target to be able establishing the methane fluxes to hydrosphere and atmosphere, and papers like this mean a contribution for getting such target constraining in this case the consumption of methane by microbial activity.

B- Individual scientific questions/issues (specific comments),

The paper shows some new results as well as an interesting compilation of multidisciplinary data from different sites. Alternatively to the use of novel concepts or ideas, I believe that the main contribution of the authors is to apply well known tools (acoustic, submarine videos, microbiological and biogeochemical) to still poorly known shallow water seeps systems.

The authors reach interesting results and conclusions using valid methods although some parts of the paper need to be clarified (see the following comments):

The specific comments to the paper are the following:

1- Page 982- line 20 says: -most of the 5 giant (Scanner, ) and two medium size pockmarks.. Question: What is meant by a giant and a medium size pockmark?- Give some size ranges for readers.

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2.-Page 984- line 1 says: Here we focused on the hot spots for microbial methane etc  
Comment: I suggest to change hot spots, for another word as this term in geology has a very specific meaning in Plate Tectonics (high temperature, volcanisms etc). Although here is used with other sense, I would suggest to be changed by something like - here we focused on the most relevant areas for microbial methane- or something similar.

3.-Page 984 line 7 says: (140-190 m) Comment: this means ((140-190 m water depth?)

4.-Page 985-line 9 says: iron fluxes Comment: better to say iron geochemistry

5.-Page 985-line 14 says: From all six multicorer samples retrieved from the mat covered area, Comment; better to say: From all six multicorer samples retrieved from the bacterial or white mat covered area,

6.-Page 986-lines 10 and 11 say: In comparison to highly active seep sites such as Hydrate Ridge, concentrations of lipid biomarkers at Gullfaks and Tommeliten were low. Comment at least briefly which are the ranges of concentrations of lipid biomarkers at Hydrate Ridge for comparing with those at Gullfaks and Tommeliten

7.-Page 986-line 18 says: -41 and -57, respectively) Comment: according to Table 2 should be -59 and -41, respectively)

8.-Page 987-lines 3 says: the 13C value of C16... of -82 Comment: according to Table 2 should be the 13C value of C16... of -77

9.-Page 987-line 11 says: signatures of -41 to -52 Comment, according to Table 2 should be: signatures of -41 to -42

10.-Page 987-line 20 says: values of -11 and -117 Comment, according to Table 2 should be: values of -115 and -117

11.-Page 989-line 11 says: of the DAPI stained cells. Comment: make the note of the station number. of the DAPI stained cells at station 771

12.-Page 989-line 16 says: ANME-2c cells. Comment: note the Table 4. ANME-2c

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cells (Table 4).

13.-Page 990-line 14: ANME-2c cells. Comment: note the Table 4. ANME-2c cells (Table 4).

The scientific methods and assumptions are valid and clearly outlined and the results support the interpretations and conclusions. Nevertheless, the formula (2) in page 979-line-1 shows the abbreviation msed which is not explained. There are also several mistakes referring the equations (1) and (2):

Page 979-line 2 begins as: In Eq. (2) Comment: Should say: In Eq. (1) Page 979-line 3 ends as: In Eq. (3) Comment: Should say: In Eq. (2)

The authors give proper credit to related work and they make clear in the paper their own new contribution

C- Technical corrections (typing errors, etc.).

Typing errors:

1-Page 973-line 4: Change emission by emissions

2-Page 974-line 11: Change Hovland et al., 1985 by Hovland Sommerville 1985

3-Page 976-line 8: appears (m.b.s.f.) and in Page 976-line 10 appears bsf; please be consistent using abbreviations.

4-Page 981-line 13: Put 4žC

5-Page 981-line 20: Change Pernthaler (2002) by Pernthaler et al.,(2002)

6-Page 984-line 7: Change (140-190 m) by (140-190 m water depth)

7-Page 987-line 21: Change (..methane= -70 (Judd and Hovland, 2007) by (..methane= -70, Judd and Hovland, 2007)

The references are appropriated but some of those do not appear in the reference list.

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Please check these:

1-Page 978-line 15: (Krüger et al., 2005)

2-Page 980-line 4: (Elvert et al., 2005).

3-Page 987-line 16: (Michaelis et al., 2002)

4-Page 990-line 6: (Treude et al., 2007)

In the list of references:

1-Page 1003-line 2: Change in Treude ..., 2005 by 2005a

2-Page 1003-line 5: Change in Treude ..., 2005 by 2005b

These two references appear in the text in:

1-Page 990-line 4: Change (Treude et al., 2005) by (Treude et al., 2005b)

2-Page 995-line 29: Change (Treude et al., 2005) by (Treude et al., 2005a)

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

**BGD**

5, S332–S336, 2008

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