

## ***Interactive comment on “Mechanisms for the suppression of methane production in peatland soils by a humic substance analog” by R. Ye et al.***

**Anonymous Referee #1**

Received and published: 11 March 2014

The manuscript “Mechanisms for the suppression of methane production in peatland soils by a humic substance analog” by Ye et al. describes the results of a laboratory study on the effects of AQDS addition on methane and CO<sub>2</sub> production in fen and bog samples. Additionally, related factors, like temperature, acetate and H<sub>2</sub> production, and the effect of glucose supplementation were investigated.

General comments:

The manuscript is well structured and written, and consequently easy to read and understand. Thematically, it falls into a highly interesting and timely field of research. The understanding of the environmental regulation of methane emissions from such important sources still is limited, but on the other hand will have important consequences for the determination of global greenhouse gas budgets.

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The combination of microbiological as well as geochemical methods applied here is sufficient to tackle scientific questions on the environmental regulation of methane production in the selected environments. The experiments presented provide a solid piece of laboratory work, well planned and conducted.

A weakness of the manuscript is the lack of additional data, for example carbon stable isotopic signatures would have been good to get a better impression of the importance of the different methanogenic pathways for the different systems. Second, a molecular biological tool, like cloning or a fingerprinting assay, RNA or SIP, would be important. This would provide important and more detailed information on active microorganisms, metabolic processes and their possible regulation and relationships.

The figures all look very similar. The authors should consider to provide an illustrative “summary figure / sketch” presenting the most important findings on relationships and regulatory factors at-one-glance.

Specific comments:

Abstract

Please state more clearly what the new findings of your study are, and what the important implications for global greenhouse gas budgets.

Introduction

Concerning acetate and peatlands, there presumably is more literature to be cited (e.g. by H Drake, K Küsel, SH Zinder, J Parkes and colleagues) which could be valuable for the interpretation of the presented results.

Please add in the introduction an explanation and comparison of “bog” and “fen” for the less expert / non-native readers.

Methods

Page 10, lines 193ff: Can you exclude any chemical effects caused by the H<sub>2</sub> present

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in the glove box?

#### Discussion

Page 17, lines 346f: Was the absence of “endogeneous inorganic and organic TEAs” checked experimentally, via direct measurements or determination of microbial activities?

Page 19, lines 388f: What might be the mechanisms behind the inhibition, what the affected microbial groups?

Page 21, lines 440ff: Also it will be very important in the future to reveal the respective microbial communities, their relationships and regulations.

Page 25, lines 522: Please point out more clearly what is really new in this study, what re the “take home messages” / rules in the system?

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Interactive comment on Biogeosciences Discuss., 11, 1739, 2014.