

Interactive comment on “Methane production in aerobic oligotrophic surface water in the central Arctic Ocean” by E. Damm et al.

Anonymous Referee #2

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Review of “Methane production in aerobic oligotrophic surface water in the central Arctic Ocean”

By Damm et al., 2007

General comments:

First I want to apologize for the delay commenting this work.

The supersaturation of methane in the surface ocean known as the "paradox of methane" has been the subject of numerous investigations. This manuscript addresses this issue in a very attractive region of the ocean. The in situ data and the conducted experiments will have a very useful contribution to the understanding of methane production in oxic surface waters from DMSP with no phosphate limitation. However, I

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have some points about the experiments setup and about the author's assumptions of CH₄ supersaturation loss during the advection of the Pdw.

Specific comments:

P10358 L22-24: The advection of rich-CH₄ waters from the Arctic shelf is a probably source of high-CH₄ concentration waters. I think that the depletion of the CH₄ concentration from the Arctic-derived waters is not well sustained. Please cite the studies that support the depletion.

P10360-10361: Microcosms experiments: Figure 4 shows that the first 6 days of experiment, the methane concentration was similar for both experiments, with and without addition of DMSP. After that time, there was a significant increase in methane concentrations in the experiments with DMSP. Due to the experiments are conducted trying to explain the methane production in oligotrophic and highly oxygenated waters; What was the follow-up did to the incubation bottles on variables such as oxygen, phosphate, nitrite and nitrate. How to ensure that the original conditions of these variables are retained after so many days of incubation? Also, what happened with the bacterial community in the experiments without DMSP enrichment?

P10363: The authors explain how the sea-ice cover in the central Arctic is acting in the gas exchange. However, the authors not considered the ice melting dynamic in the slightly lower CH₄ concentrations of the Adw (Rees et al 1997; Gosink 1980). The ice and melting waters have been shown as containing extremely low gas concentrations. In September, the both water masses, Adw and Pdw, should have different contribution of melting water, finally influencing the CH₄ concentration in the Arctic region.

P10368: The thermodynamic calculations appear to be a useful tool for explaining the DMSP use producing methane. However, this part of the manuscript is very hard to follow.

Finally, in order to make easier the comparison of the two bodies of water (Adw and

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Pdw), I suggest that the authors make a Table with all results from both bodies of water, as density, d13C values, plankton composition, N*, phosphate, methane and DMS and DMSP concentration range, etc.

Technical corrections:

P10357 L20: "Most of the dissolved DMSP, however, is sequentially demethylated" This phrase appears some confused as the authors mentioned in the L16.

P10357 L23-24: "Tallant y Krzycki (1997)". Please correct here and in the references "Tallant and Krzycki (1997)"

P10360 L8-9: Please specify the calibration points.

P10360 L9-10: "This high overall error is almost exclusively due to the gas extraction..." What meant gas extraction ? (headspace technique, manual injection, and/or equilibration).

P10360 L21-25: Please specify the GC conditions to DMS measurements as was made for CH4 analysis. Same for calibration.

P10361 L09-10: Why the CARD-FISH and DGGE-analysis were realized only for experiments spiked with DMSP and not for blank experiment?

P10363 P14-22: The authors incorporate the values of d13C for the Adw in the text. However, there are not d13C values for Pdw, forcing the reader to turn to the figure. Please consider to include the values in the text.

Figure 1 map: What are the black points?

Figure 1c: NOx. Is it the nitrate concentration? Nitrate plus nitrite?, N*? Please change or explain.

Interactive comment on Biogeosciences Discuss., 6, 10355, 2009.

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