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Biogeosciences Discussions

Interactive comment on "Fine scale variability in methanol uptake and oxidation in the micro-layer and near-surface waters of the Atlantic" *by* J. L. Dixon and P. D. Nightingale

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1. 'Overall the paper is clearly written, but the presentation of the results could be more synthetic. I suggest that the data presented in some of the Figures should be presented in Tables.'

Thank you. Figures 2 and 3 have been combined and are now presented in a new Table 1. The text has been edited accordingly.

2. 'The discussion is too much focussed on methanol utilization rates. . ., I suggest that the authors include other aspects into their discussion e.g. other measures of microbial activity and changes in the top layers of the ocean'

We have now added in other measures of microbial activity such as BGE, community respiration, bacterial production and DMS concentrations.

3. Methanol is predominantly respired, independent of depth. How does this compare to other compounds e.g. bacterial growth efficiency etc?

The BGE for methanol has been calculated as a function of depth and is shown in a new Figure 8. This has been compared to the literature on bacterial growth efficiencies in the North Atlantic.

4. 'I suggest that the authors discuss their results in the context of a generally observed decrease in bacterial heterotrophic activity with depth as observed my many other studies'

This has been added to the Discussion as suggested.

Addition to the Discussion section as detailed in 2-4 above now reads;

'Bacterial growth efficiency for methanol (BGEm = G/(G+E)*100) is summarised as a function of depth in Figure 8 and suggests that in the top 0.25-25m of the sunlit part of the water column the average BGEm is approximately 6% (0.4-26%), which compares to BGE of 5 $\pm$ 1% for open ocean North Atlantic waters (Kirchman et al., 1991), 7 $\pm$ 3% for Sargasso Sea (Hansell et al, 1995) and between 1-8% for the Bay of Biscay (González et al., 2003). Generally BGEm decreases with depth, in a similar pattern to that of BGE determined from bacterial production and respiration e.g. Alonso-Sáez et al., 2007, which is normally considered as a consequence of decreasing bacterial production with depth e.g. Barbosa et al., 2001 with relatively constant bacterial respiration (del Giorgio et al., 2011). Although the mean BGEm for microlayer/10cm samples is less than those from the underlying 25-217 cm layer, possibly implying that increasing environmental stress e.g. UV results in cellular increases in maintenance and repair costs e.g. energy (del Giorgio et al., 2011, del Giorgio and Gasol, 2008, Carlson et al., 2007). Obernosterer et al. (2005) also reported enhanced community respira-

BGD

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tion rates in the surface microlayer compared to sub surface waters, whilst a depletion in dimethylsulfide at 10cm depth compared to underlying waters was consistently reported by Zemmelink et al., (2005). Although high outliers in BGEm of between 8-26%, due to relatively high rates of methanol incorporated into cellular particulate material, suggest that hot spots of methylotrophic activity exist in the near-surface layers.'

5a. Do the authors have concurrent measurements of methanol concentrations in the different depth layers?

Unfortunately not, the methanol analysis technique had not been developed in time for this cruise (D320)

5b. 'If not I suggest that the authors mention methanol concentrations determined previously in the study region'

Unfortunately there are no methanol concentrations available for this particular study area, either in the literature, or from data we currently have. In addition, the only published data in a perhaps comparative Atlantic region is from the surface only.

Interactive comment on Biogeosciences Discuss., 9, 4513, 2012.