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Interactive comment on “Rapid biological oxidation of methanol in the tropical Atlantic: significance as a microbial carbon source” by J. L. Dixon et al.

Anonymous Referee #1

Received and published: 13 June 2011

Review of Dixon et al.

Dixon et al. present measurements of methanol concentration and turnover time in a range of oceanic settings. Their findings inform present understanding of the biogeochemical cycling of methanol in terms of: 1) the importance of methanol for meeting bacterial carbon demand in the ocean; 2) the sources of methanol in the surface ocean; 3) the range of methanol concentrations and turnover times in the surface ocean; and 4) the extent to which methanol consumption by microorganisms is used to fuel energy production versus cellular growth.

The paper is well-written, the analysis is sound, and the data is a valuable addition

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to an important and under-constrained problem. I have a few suggestions that in my opinion would improve the paper, but they are minor, and I recommend publication essentially as-is.

My only significant complaint is that the abstract is missing a lot of the key points from the paper. This is an issue because most people will only read the abstract! E.g., you mention the turnover time is “as low as 1 day”, but it’s equally important to know how widely the values ranged, and whether they varied in any kind of coherent way. The fraction of methanol used for energy versus growth is also a valuable and unique finding, but it doesn’t even make it into the abstract? Also, there have been very few measurements of methanol concentration in the ocean mixed layer, and so a summary of your measured concentrations should be in the abstract. Lastly, your finding that methanol’s contribution to bacterial carbon demand varies in a predictable way with chlorophyll content is great and should be stated up front!

Figure 3 and the associated discussion is a very nice synthesis of the data in terms of how the methanol contribution to bacterial carbon demand varies with chl-a. Is there a similar synthesis you can provide describing how the concentrations and turnover times vary? Ideally there would be some coherent relationship like in Fig 3 that could be used in a model, but at the least some space in the discussion section should be devoted to explaining and summarizing the observed variability in methanol concentration and turnover time.

3900/23-25: this methanol / formic acid / pH connection is not totally clear-cut. E.g. Jacob (1986) argues that formic acid affects cloud pH but mainly via scavenging from the gas-phase; with in-cloud formic acid production too slow to affect pH much. So an additional citation or two here on this issue would be helpful to the reader.

3901/16: “volatile organic carbon compounds” . . . odd phrasing, is there another kind of organic compound besides the carbon variety?

Section 3.1.1. These E:G ratios are interesting; can you put them into context for

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the non-expert reader? Your ratios range from 360:1 to 12:1, i.e. 92 to >99% of the methanol is being used for energy rather than cellular growth. Are those values anomalous, or similar to any previous measurements for other carbon compounds?

3904/3, and Fig 1: A citation or URL should be provided for the MODIS data. In the figure caption, “modis” should be “MODIS”.

3909/17-22: run-on sentence; the reader glazes over.

3911/24: “often elicited necessary” ?

Fig. 2. Missing symbol designator for station 3 in the caption. Also, specify the time zone for the x-axis (local versus UTC?). And what are the error bars (range, SD, ...)?

Fig. 3: End of y-axis title is cut off.

Interactive comment on Biogeosciences Discuss., 8, 3899, 2011.

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