

Interactive
Comment

Interactive comment on “Air-sea fluxes of methanol, acetone, acetaldehyde, isoprene and DMS from a Norwegian fjord following a phytoplankton bloom in a mesocosm experiment” by V. Sinha et al.

V. Sinha

vsinha@mpch-mainz.mpg.de

Received and published: 30 November 2006

We thank referee 1 for the prompt feedback and would like to address her/his remaining concerns in this response. Referee 1 still has reservations about the mesocosm system acting like a greenhouse and mentions that PAR and mesocosm temperatures from a sunny day and a day with overcast conditions should be compared to assess the so called ‘greenhouse’ heating effect within the mesocosm system. In order to address these concerns adequately, we will include plots showing the depth profiles (0-5 m) of the temperature in the waters of mesocosm 7 and mesocosm 8 in the final

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Date	T_{water} M8 at 11 a.m. (K)	$T_{min.} - T_{max.}$ air (K)	PAR at 11 a.m (μmol $\text{m}^{-2}\text{s}^{-1}$)
31.05.05	283	281-287	1238.5
01.06.05	283	279-285.5	1277.9
02.06.05	283.5	280-285.5	1241
03.06.05	284	280-285	183.19 (overcast day)
04.06.05	284.5	283.5-287	546.98
05.06.05	284.7	280-284.5	855.47
06.06.05	284.7	279-283	1218.9
07.06.05	285	278.5-284	1083.3
08.06.05	284	280.5-286	198.27 (overcast day)
09.06.05	283.5	281-285	116.25 (overcast day)
10.06.05	284	280-283	1287.1

revised version. Unfortunately, submitting a figure for the interactive discussion is not an instantaneous process on ACPD, so we have made a table which should prove conclusively that PAR does not heat up the mesocosm like a green house on sunny days.

The table lists the water temperature (data of temperature in mesocosm water courtesy Dr. Kai Schulz, IFM-GEOMAR, Kiel, Germany) and PAR measurements at 11 am (when PAR is almost at its highest for the day, see Fig 4) for all the days described in our study. Clearly, the temperature in the water of the mesocosm does not differ significantly for the 'sunny' days compared to the overcast days on the 3rd, 8th and 9th June. We reiterate here from our previous comment, that the wind buffeting and wave action on the sides of the mesocosm tents coupled with the constant ambient air flushing rate of 30 L min^{-1} ensures good mixing of the mesocosm headspace air

and prevents the accumulation of thermal energy within the mesocosm system quite efficiently.

The second concern of referee 1 pertains to the issue of the surface microlayer. The referee is right in understanding that the upper 5 m water column in the mesocosms was not 'bubbled'. Water in the first 5m was continuously circulated by means of an aquarium pump, the outlet of which, was set near to the surface which acts to inhibit microlayer formation. Interestingly, in the original review, the referee had questioned how PAR profiles and emissions of isoprene, acetone and acetaldehyde mirror each other without any significant time shift. Isoprene is well established biogenic emission of marine organisms like plankton, algae and even certain microbes. There is no evidence in literature and no reason to believe that isoprene is strongly emitted from the surface microlayer. Acetaldehyde correlates strongly with isoprene ($r = 0.86$) and both emissions mirror PAR profiles without any significant time shift. This points to the fact that transport, diffusion and mixing between the bulk and surface waters for the gaseous emissions must have been strong enough to overcome the surface resistance. Based on this observation, it seems plausible that the combined effects of the waves buffeting the mesocosm tents and the internal mixing within the upper 5 m water column, prevent the occurrence of a persistent surface microlayer.

As a final point we note that our emissions are reported in $\text{ng m}^{-2}\text{s}^{-1}$ i.e. as a flux and not as a ng m^{-3} 'emission factor' as stated by referee 1. Referee 1 advises that we should somehow suppress the fluxes obtained in the mesocosm study, simply because the conditions in the mesocosm set up are not exactly representative of open ocean conditions and these fluxes may be quoted out of context. While we appreciate the referee's concerns we respectfully disagree for the following reasons. We have already made it amply clear in the title, abstract and the discussion, that these fluxes were obtained in a mesocosm experiment. The fluxes indeed highlight the potential importance of the ocean. In our opinion it is the responsibility of the persons implementing these fluxes elsewhere to judge their suitability and one should not understate results

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just because others might quote them out of context. It is our considered opinion that the mesocosm approach is a new and novel technique, particularly suited for clarifying the vast uncertainties that exist in the field of Ocean VOC uptake and emissions and the biogeochemical cycling of VOCs.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 9907, 2006.

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