

Interactive comment on “Formation and distribution of sea-surface microlayers” by O. Wurl et al.

Anonymous Referee #1

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General comments

Based on the global surfactants enrichments in the sea surface microlayers (SML) and taking into account global primary production (PP) and wind speed, Wurl and coauthors developed model of global maps of surfactants in SML for the different seasons and different trophic conditions. They find out that the ocean's surface is covered to a significant extent. The authors presented impressive data set supporting their conclusions. The concept of surfactant global mapping is certainly important, and the approach using PP and wind speed is good. My basic concern is that authors based all discussion on the surfactants enrichments in the SML, and not on the real concentrations. It is known that quantity as well quality of surface films effects gas exchange. Therefore, it would be also important to present global maps for SML coverage with absolute sur-

C2580

factant concentrations. Namely, even high enrichment in a case of low bulk surfactant concentration (like oligotrophic oceans) would come also to low surfactant concentration in SML. And opposite, in coastal productive regions low EF still may be obtained for very high surfactant concentrations in SML. I think that is important authors to state why surfactant enrichment is more important than real SML surfactant concentrations for the global influence on the air-sea gas exchange. The manuscript is well structured and mainly clear, the language is fluent. The title is not indicative on what the authors presented. Up to my opinion it should be changed. The paper should be acceptable for publication after revision.

Specific comments

ABSTRACT I do not agree with the sentence: “Global maps of primary production and wind speed are used to estimate the ocean's SML coverage” as the authors presented surfactants enrichments and not concentrations.

INTRODUCTION Page 5721, line 5: reference is missing. I would suggest: Plavšić, M., Ćosović, B. 2000. Adsorption properties of different polysaccharides on mercury in sodium chloride solutions. *Electroanalysis* 12, 895–900.

METHODS Page 5723, lines 1–4: I suggest to remove: “collected by a withdrawal rate of 5–6 cm s^{−1},” as it is repetition; to move: “as consistently as conditions allowed” to the first line. Reference Carlson, 1982 is unnecessary. Page 5724, line 16: Please add reference after “the standard addition method.” as this approach is not used in Ćosović and Vojvodić (1998). The authors should add much more details on how they have measured surfactants. Like it is explained now, no one may perform surfactant measurements as the authors did. Page 5724, lines 16–17: It is incorrectly written. If the precision is less than 10% that would mean that reproducibility was very bad.

RESULTS Page 5728, lines 24–25: There is mistake in this sentence, probably in the value of EF (“i.e. EF>2.7”) given in line 25. Page 5728, line 27: I suggest removing last part of sentence: “that means under eutrophic conditions” as blooms are regularly

C2581

happening also in the oligotrophic seas. Page 5729, lines 11-13: I concern about the statement that higher SML enrichments led to enhanced formation of SML. Page 5729, line 26: I would suggest to add "surfactant enrichment" after The choosen..

DISCUSSION Page 5735, line 10: reference is needed after: microbial respiration. I am also not sure on this statement. Page 5735, lines10-12: The authors based their discussion on domination of terrigenous OM in coastal SML, with what I do not agree for the reason of often high autochthonous OM production in coastal region. Page 5735, lines12-16: This part is speculative as it is not supported by referencing proving different OM matter produced in the oceans and in coastal regions. Do really authors think that coastal SMS is really mainly of terrigenous origin and oceanic SML is of autochthonous origin. Page 5736, line 9: reference is needed after: compounds. Although I agree that significant bacterial decomposition in coastal regions may influence significant decrease in OM content in coastal SML in comparison to oceans the authors did not support adequately their suggestion: "Overall, we suggest that higher enrichments in oceanic SMLs originate from more resistant DOM and lower bacterial respiration compared to coastal SML." In fact, whole section starting from page 5734, line 19 to page 5736, line 12 needs be rewritten to better clarify authors suggestion of this section.

TABLES Table 1. If \bar{x} is number of non-slick samples, where is number of all samples? Table 2. To remove word surfactant after: "Statistical data on", and also to add \bar{x} and total dissolved carbohydrates (TDC) after: "of surfactants". Please put SAS and TDC in brackets in EF SAS and EF TDC. Correct all numbers to be with points instead of commas (same in Table 3). After CI add b as superscript, and add text like in Table 3: b Confidence interval of the mean Please uniform: sd or SD (lower or upper case)

FIGURES Fig. 1. In the fig caption instead of LineP should be written NP, or maybe line NP. Figs. 2, 3, 5 and 6: y-axe title should be designated as Surfactant or TDC to be in brackets or as subscript as it is in Fig. 4. Please make it uniform. The colours in

C2582

Figs. 4 and 5 for offshore and oceanic samples are too similar (blue and green). Maybe one of those may be black to improve visibility. Fig. 5. Explanation for broken line is missing. Fig. 6. In the fig caption replace rhombus symbol for PP with the symbol square, as it is in the fig. Fig. 7. The fig caption is not good. I would suggest: Global maps of surfactants SML-enrichments.... In this case last sentence \bar{x} Please note that maps represent enrichment factors (EF) and not absolute SML concentration \bar{x} may be excluded. The fig is unclear. I would suggest enlarging it at least to the width of fig caption, to add black continent edges, to use darker yellow in the fig.

Technical corrections

Page 5720, line 17: comma is missing after 12 ms-1. Page 5720, line 20: thickness instead of thinnes Page 5721, line 11: Tsai instead of Tasi Page 5721, line 18: comma is missing after ocean surface Page 5723, line 17: to remove "—" after AC, to be the same style as it is in the Fig. 1. Page 5724, line 7: to remove "(instant wind speed)", as it is repetition. Page 5725, line 12: to remove "the" after: of euphotic Page 5727, line 19: to remove "(OneWay ANOVA, p=0.1410)", it is unnecessary text. The same is valid for page 5728 line 2: "($p>0.05$)". Page 5728, line 3: "p" is missing before: " <0.0001 ". Page 5728, line 7: to shift "(i.e. 5–10ms–1)" from the sentence end to the after: "the higher wind regimes". Page 5728, line 21: lineP should be NP or line NP. Page 5730, line 3: comma is missing before Eq. 2. Point is missing at the end of the sentence. Page 5740, line 19: Electroanalysis instead of Elektroanalysis Page 5740, line 19: doi is unnecessary