

Biogeosciences Discuss., author comment AC1
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Reply on RC1

Theresa Barthelmeß and Anja Engel

Author comment on "How biogenic polymers control surfactant dynamics in the surface microlayer: insights from a coastal Baltic Sea study" by Theresa Barthelmeß and Anja Engel, Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-128-AC1>, 2022

We are very thankful for the reviewer's contribution to this manuscript.

1) Based on the first comment, we included the major findings of our study into the conclusion to support the hypotheses presented.

'Carbohydrates and amino acids along with other DOC components contribute to surface activity during periods of low and moderate primary production in the coastal Baltic Sea. In the post-spring bloom phase (June), the surfactant pool is microbially altered, as it is defined by the non-essential amino acid serine and carbohydrate polymers, which include a high fraction of Mannose and Xylose. Also, presumably allochthonous DOC complements the surfactant pool. Solar radiation may exhibit an additional control on surfactant formation, owed to photo- or pH-transformation of polymers, as surfactant concentration accumulates in the afternoon. A rather persistent surfactant pool maintains a steady background effect on air-sea gas exchange in boreal summer. At the end of the summer bloom phase (September), on the other hand, the highest surface activity is triggered by the release of fresh and microbially available products, prominently represented by dissolved combined glucose and essential amino acids, which are associated with the abundance of nano-phytoplankton cells (2-20µm). Our findings show that labile surfactants may cause major peaks in the suppression of air-sea gas exchange although their effect is potentially transient. Therefore, we hypothesize that phytoplankton products contribute substantially to the surfactant stock but organic matter release mechanisms and microbial turn-over times rather than incident primary production control surfactant concentration. To constrain net fluxes of greenhouse gases in coastal seas, future studies should focus on carefully aligning seasonal and diel patterns of greenhouse gases and surface activity. With this work, we contribute novel insights into the temporal resolution of surfactant dynamics and their biogenic composition on a local scale.'

2) As suggested, we have now defined numbers in bold and the significance levels, indicated by asterisks, in the table headers.