Biogeosciences

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Discussions

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Interactive comment on "On biotic and abiotic drivers of the microphytobenthos seasonal cycle in a temperate intertidal mudflat: a modelling study" *by* Raphaël Savelli et al.

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The manuscript details a biophysical model to describe primary production, biomass and grazing of MPB on a tidal flat. The work found that the annual cycle of biomass could be reasonably described by light, temperature and grazing inhibition. A key strength of the model is that included a detailed consideration of MPB motility which is a key process in the MPB growth and survival. The factors controlling annual MPB biomass patterns are also relatively poorly understood and attempts to model this complicated process are an important contribution to our understanding and will hopefully stimulate further research to address key uncertainties.

The model showed that a combination of temperature limitation of MPB growth and grazing could explain the dip in biomass observed over summer. The temperature inhibition value used to achieve this outcome had to be 'tuned' to match the data and the temperature inhibition used for MPB was lower than in previous studies, which was concerning. How sensitive is the annual pattern to this temp? Could you show a run where Topt is ∼20 C?

Another weakness of the study was that it had a rather limited data set for validation. I am surprised the authors were not able to find a study site with a larger time series of data for grazers and directly measured MPB biomass. Given the importance of the physical model, it was also disappointing that there was very little temperature data, which is very easy to collect. The limited data available also seemed to disagree in pattern and magnitude a lot more than I would have regarded as acceptable for a physical parameter. This data weakness, was somewhat compensated for by the discussion which placed the model inputs and outputs within the context of the literature giving an overall confidence in the general applicability of the model.

One potentially very important factor missing from the model was resuspension. In my mind, this is potentially a very important factor controlling MPB biomass. In Table 1 it seems to be implied this is used in the model (process 4) and also there is later mention of a generic loss term (pg 15 line 31). In the conclusions and perspectives part of the manuscript, it then goes on to say resuspension is not included in the model. Could the authors please clarify what the generic loss term is? I also suggest the discussion of resuspension be included earlier on in the discussion, rather than being raised right at the end. I would also like to see this discussion expanded a little. At present, it really only addresses possible PP by MPB during resuspension, it does not address how much MPB might be exported. The possible resuspension and export of MPB should be discussed and omission from the model justified. Is it possible the loss of biomass is just resuspension on a few windy days?

The manuscript was generally well written and the ideas well constructed. There were

a few spelling and grammatical issues. I have noted a few below, but it would be easiest for the authors to use a spell checker to find these.

Minor comments Pg 6 line 7. Consisted of

Pg 6 l19. Could clarify a little better that (1st cm) means 1st cm of sediment.

pg 8 line 32 onwards. This is a little confusing. first it is stated that grazing is mostly limiting, then it says days where MPB biomass consumed was larger than that produced occurred only 8.7% of the time.

Pg 10 line 31 developing

Pg 12 line 9 delete too

Pg 12 line 15 detrimental

Pg 12 line 26, in that respect (check all uses of this)

Pg 12 line 32 oxidation

Pg 13 line 4. This sentence just repeats the last one, delete

Pg 15 line 13. This implies a very high growth efficiency (13.63/15.8). Can this be correct? Or do they graze other food sources too?

Figure 5. I don't understand why there is a small plot (original data) for biomass. If this is from the model, it should be more continuous? Or perhaps you have only extracted the same days as the NDVI data? Why not show all the data?

Figure 9b. Caption could specify days dominated by grazing pressure when temperature is greater than grazing optimum (T > Toptz). I found this a little hard to understand at first.