**Biogeosciences
Discussions**

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Interactive comment on "Temporal variations in microbial activities and carbon turnover in subtidal sandy sediments" *by* S. I. Böer et al.

S. I. Böer et al.

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Thank you for your comments on our manuscript. Answers to your comments are given below.

In this manuscript, the authors try to bring information on bacterial abundance, bacterial carbon production, extracellular enzymatic activities and respiration in subtidal sandy sediments. This is an exhaustive and meticulous study including the vertical distribution of physico-chemical parameters (T, pigment, substrate biodisponibility) as well as rates of bacterial activities. The follow-up was carried out bimonthly during one year. Although rather descriptive this study is certainly an interesting work.

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We do not agree that our study is mainly descriptive. We undertook an extensive analysis of factors governing temporal patterns in microbial carbon turnover in subtidal sands, which has never been done before in such detail. We believe that this approach is explanatory rather than simply descriptive, as exemplified by our calculation of carbon budgets. The carbon budgets include best possible estimations, since it is beyond the technical capabilities of the community as a whole to simultaneously quantify all of the parameters involved. In any case, the estimates are relevant for understanding coastal nutrient cycles.

However, these data described the sampling site (only one) and it would be dangerous to extrapolate these conclusions to the sandy ecosystems. The authors have a good knowledge of the studied ecosystem but the conclusions are often speculative and not always supported by data reported in the present paper.

Like all complex time series studies, our study is of limited spatial extent, because it is not possible to cover both spatial and temporal variability of a large number of environmental parameters. This is particularly true for time series studies in the benthos where the sampling effort and sample treatment is far more time consuming and difficult than studies in the pelagic ecosystem. We have not extrapolated any findings to the entire ecosystem "sand", but we will of course carefully revise our manuscript to make sure that we avoid creating such an impression. However we would like to point out that it is relevant to consider the observed variations and relations in long term studies of bacterial carbon turnover in subtidal sands. Furthermore, when comparing our findings to available data from other studies using similar approaches, we see that our results are within the range of turnover rates observed for other sandy sediment sites which, however, lacked the time and depth resolution of the present study.

I know that it is sometimes inescapable but I think it is difficult to compare rates

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obtained with slurries and cores or compare oxygen fluxes and activities integrated on 5cm or more.

We are aware that rates obtained with slurries and cores may differ significantly, however we have used the standard methods available to quantify concentrations, inventories and rates in sandy sediments, and we have discussed extensively the limitations of the methods we used in the text.

Comparison with literature of oxygen consumption rates is based on the use of a factor of correction, I don't know if this factor can be used whatever the size grading of the sediment. Moreover oxygen fluxes were determined without carbon amendment whereas activities were potential activities showing the capabilities of the bacterial communities rather than their in situ activities.

Comparison with literature partly referred to data that was obtained at the same sampling site with other techniques, thus the size grading of the sediment is similar to the one we had in our study. Any means of estimating enzyme activities involve addition of fluorogenic substrate, because the complex composition of enzymatically available organic matter cannot be quantified. We discussed benthic oxygen consumption rates for reasons of completeness, but all our turnover estimations describe potential turnover rather than in situ turnover, a point that was stated throughout the text.

Why respiration rates were not included in statistical analyses?

We were not able to obtain cores for respiration measurements in November 2005. Also, these rates were integrated over the entire core (15 cm) while all other measurements were done at 0-5, 5-10 and 10-15 cm depth. Statistical computations do

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not allow "empty spaces"; in the tables used for analyses, thus for methodological reasons it was not possible to include respiration in the PCA.

Minor points: Hydrolysis rates were given in μmol per m^2 (Fig 2), per L (Fig 3) and per cells (in the text).

We are aware that using different units for measurements adds complexity, and have generally avoided it. In the case of hydrolytic rates, we needed to make sure rate measurements remain comparable to other literature, as it is common to use volumetric estimates. For the discussion of budgets, we had to integrate the rates to the area, and for the discussion of microbial functions it needed normalization to the cell (cell specific rate).

There is an error in the text with units for BCP mmol L^{-1} instead of mmol L^{-1} D^{-1}

We have revised the manuscript accordingly.

Interactive comment on Biogeosciences Discuss., 5, 4271, 2008.

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