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Biogeosciences Discussions

Interactive comment on "Carbon sources supporting benthic mineralization in mangrove and adjacent seagrass sediments (Gazi Bay, Kenya)" *by* S. Bouillon et al.

Anonymous Referee #2

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General comments This is clear and well written paper that provides a new and interesting data set with which to assess the use of 13CPLFA as tracers of the source of carbon used by sedimentary bacteria. This is a relatively new application of the technique and it is very timely that a comparison of data from a range of sedimentary environments be made. The results are logically discussed and carefully appraised. One of the main outcomes of the paper is that bacterial 13CPLFA generally reflect the relative abundance of all sources of organic matter in the sediment. This is an interesting conclusion given the presumed differences in lability of organic carbon sources to bacterial attack.

Specific comments Section 4.1 While there is some correlation of seagrass sediment 13C with 13CPLFA (Figs 4, 6), this does not seem to hold for the mangrove sediments (Figure 4) and yet this aspect is not discussed (only depth dependant changes of carbon substrates to sedimentary bacteria).

A simple mass balance calculation is used to estimate the likely proportion of mangrove organic matter at the seagrass sites. The mangrove end-member is used in this calculation. Is this appropriate given that it is earlier stated that mangrove sediment is 2L' enriched over plant source? Or is it assumed that a similar enrichment occurs for both seagrass and mangrove?

I think that the limitations of using a simple, two source, mixing model were understated. Firstly the authors do not include phytoplankton inputs as the POC/chl-a ratios were high. While this is consistent with live phytoplankton being a small proportion of the suspended particulate load it does not mean that dead phytoplankton do not make a significant contribution to the suspended particulate load. The chlorophyll may degrade on phytoplankton death, increasing the C/chl ratio but the organic matter will persist for longer and the isotopic composition of the phytoplankton would not be significantly changed. Also, in section 4.3 the isotopically enriched d13Ci+a15:0 in the mangrove cores has been interpreted as possibly a microphytobenthos source to surface bacteria. Although there are no depth related data available why is this scenario not applicable to the seagrass cores, i.e. that microphytobenthos may represent a C source? Finally although it is difficult/impossible to quantify, could the seagrass epiphyte community not contribute to the sediment C through faunal grazing and defaecation? These discussions are pertinent to the solution of the bacterial 13CPLFA 2-box model too.

Is there any information on the role of bioturbation in these or these type of sediments? Would the depth dependant PLFA trends be expected to be maintained if the sediments were bioturbated?

The PLFA and to some extent their isotopic signature relate only to bacterial biomass. Would it be expected that changes in biomass values would also be reflected in mineralisation rates, in so far as bacteria with the highest biomass may not do most of the remineralisation?

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Technical corrections In material and methods, sediments from seagrass beds were collected at 7 locations and yet in Figures 2B and 3 there are more than 7 seagrass data points. Figure 1 does not clearly show the seagrass sites, a lighter background for the mangrove areas would help. Presumably the seagrass sites are not discrete meadows but are sampling sites within continuous meadows? In Figure 2 the identifiers A and B are not visible and the 2y axis on 2B needs the scale adjusting. The legend to Figures 3 and 4 have been swapped. Figure 4A should be cited in the text at the end of the 1st paragraph of the results. In the results section, bulk seagrass sediment values have not been reported. Its is stated that bacterial PLFAŠs were selected for isotope analysis, on what basis was this selection undertaken? Can the significance (p values) of the depth trend in bulk 13C at the mangrove sites be added to the results and section 4.1.. Section 4.2 Can the p value for the significance of the depth-wise increase in relative abundance of sulphate reducer PLFA and the difference between seagrass and mangrove sites and correlation between cy 19:0 be given. Section 4.3 Second paragrah can the phrase Şcorrelates fairly wellŤ be given some statistical value. In Figure 6, the A is not visible on the graph. Page 322 line 17 ŚanŠ should be ŚandŠ

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