

General Comments

This study investigated effects of salinity in coastal forested floodplains on soil carbon pools and microbial community structure. The authors use FTIR to characterize the chemical species within the soil C pool and molecular techniques to characterize and correlate microbial community structure to soil C chemistry, as well as compare all measurements between the different salinity sites. The ecosystems studied are unique and interesting and at the fringe of TIAs which have clear importance as sea levels continue to rise and salt water intrusion into freshwater systems is likely to alter soil and ecosystem level C cycling dynamics within these fringe ecosystems. I think the study has value to be published and readers of BGC will be interested in the findings, although I have a few major suggestions, primarily in the writing style.

I find the writing to be good overall, but is too generalized in that there is not enough detail given for the use of specific terminology, particularly in the introduction but also throughout the manuscript. This is especially important to reach a broad enough audience and make this research have higher impact. For instance, microbial biochemical transformations, or biogeochemical transformations, were terms used a lot but it is not clear which transformations or processes the authors are referring too. See more comments on that below. Further, I found that although the hypotheses were introduced in the introduction, the lack of specificity in the introduction regarding each hypotheses made it challenging to follow the authors' logic. Overall, I think the authors should write the introduction with more specific examples from the literature they cite, showing the gaps in knowledge on the subject (salinity effects on soil processes in TIAs) and how this study addresses those gaps by asking specific hypotheses.

Abstract

Abstract is too vague, making it hard to follow what the authors studied, measured, and how to interpret these results.

L26 TAI doesn't really need an acronym here because it is never used in the abstract again.

L31 Heteroatom seems like a very specific term. It would be helpful to know the definition of a heteroatom or to use a more common term.

L34 please state salinity range here or previously

L34 what does inferred biochemical transformations mean? Are these the ones that were measured? It would be more direct to just state which biochemical transformations are being referred to.

L35 which metrics of microbial activity were measured?

L41 "Null modelling revealed strong influences on dispersal limitation" I am unclear what this means. So the microbial communities were spatially variable or distinct from each other depending on where the samples were taken?

L44 What is a community assembly process? Does this just mean C mineralization, or nitrification, or some other microbially driven process?

L44 "lack of an association" can the authors be more specific. How were microbial communities measured? PLFA? Molecular techniques? Which part of the microbial communities were compared to C chemistry?

L44 "C chemistry" can the authors be more specific? Which C compounds?

L45 “disconnect b/n community and C biogeochem” can you be more specific? What part of the community and biogeochemical processes were disconnected?

Introduction

L100 change rates to processes. Rates are not microbially driven, processes are. Which rates/processes are decoupled? Which gas fluxes? CO₂ and CH₄?

L101 Size of C pool... is this referring to the concentration of DOC mentioned in L100? Clarify

L100-103 How does a decoupling between the C pool size and microbial activity in saline environments suggest it is due to salinity exposure history? Based on how this paragraph is written, it seems like the authors can only say it is due to elevated salinity. Clarify what is meant by salinity exposure history.

L107 Microbial-activity driven??? Needs to be reworded

L98-120 this paragraph starts about discussion between relationships (or lack of) between gas fluxes, DOC, and microbes and ends in a discussion about methods for analyzing chemical constituents of SOC. This should be split up into two paragraphs or reworded to provide better flow. Maybe the first part can be incorporated into the previous paragraph.

L135 please define heteroatom as it is not necessarily a common term when describing SOC

L137-138 What is it about increasing salinity that leads to greater heteroatom concentration? This point is unsupported by the first part of the sentence which seems to just be a general statement.

L140 N mining...please be more specific...N uptake from soil? In the form of inorganic or organic N? Is it already available for uptake or do the microbes secrete enzymes to liberate organically bound N in order to take up inorganic N?

L143 clarify that the flooding that results in marine derived OM is flooding from marine salt water terrestrial systems. I assume the terrestrial ecosystem is freshwater, but up to this point there has been no mention of whether the flooded environment is already saline or is freshwater.

L150-165 As a reader, I am having trouble following the logic of this paragraph mainly due to the lack of specificity in the use of terms such as community assembly processes, ecological assembly processes, biogeochemical processes, deterministic and stochastic assembly processes, and dispersal processes. Can the authors give examples of what processes they are specifically referring to? It is too general to build a hypothesis off of based on salinity changes in the environment. What is the difference between a community and ecological assembly process? And which can be grouped into deterministic and stochastic categories?

L160 Why subsurface microbial ecology? Are the effects different in soil surface horizons?

Methods

L184 provide lat and long coordinates at the end of the first sentence

L186 Can any information be provided on the extent of inundation onto the landscape? Or the size of the floodplain?

L189 define psu

L197-199 please provide common names for species as well

L204-207 How long were the transects? At what distances along the transects were samples taken?

L208-209 I prefer to see soil taxonomic information as well as soil series information. It gives readers a choice on what to interpret. I am not that familiar with Ocosta or Mopang soil series so it provides very little information to me about the soil characteristics without having to go look it up on the NRCS.

L210 Any idea on water table depth? How deep is the water that pools on the surface?

L217-218 It would be nice to know the elevation of the floodplain, inland, and upland transects.

L219 Are shallow samples 0-10 cm depth?

L224-229 There should be a little bit more detail here on each method, or maybe citations to the methods used at the very least. Provide make, model, company etc. for Lachat. How was pH measured, conductivity, GWC, BD, and porosity?!?! What about pre processing? Was large organic matter removed including roots and litter, or retained. Were samples air dried, sieved, etc..?

L227-229 this doesn't need to be included here. It is in the following sections.

L243 followed by of....check wording

L294-295 It seems like more information should be provided on the microbial DNA procedures.

Results

L352 Table S3 is almost unreadable in the small font size

L392 missing comma after 14%

Why have the authors chosen to not include any taxonomical data on the microbial communities? It seems that this would be very useful information and I assume this information was obtainable from the methods used.

Discussion

L463-464 Here the authors have at least provided some examples of the biogeochem processes they are interested referring to.

L471 characteristics?

L472 Authors mention spatially structure inputs. I assume this is in reference to land scape variation but it would be helpful to be more specific.

L473 What metabolic responses of microbial communities were measured in this study?

L489 Suffering....awkward wording....Also this appears to be the first mention of forests/tress under stress. Can the authors elaborate on this or provide site level data confirming this?

L494 The authors didn't measure mineral associated C. How then can comments be made about that fraction of the soil C pool? Maybe because these are generally silt and clay rich soils compared to the clearly much more organic surface soils?

L533 How did the authors determine dispersal limitation? Does this mean that the microbial communities were different between the sites? This would not be surprising but is hard to determine since microbial taxonomic structure was not provided.

L542 relatively fast dynamics.....unclear what this means....fast changes in the chemistry of the C? be specific.

L556-557 I find this statement to be highly speculative given the one sampling date and the lack of measurements of any actual microbial activity metrics. I would argue that there were no measures of biogeochemical functioning in this study, just measures of the outcome of biogeochemical processes (e.g. remaining C compounds, N compounds etc.). L159 is a more accurate statement.....microbial community (although I think the microbial community structure, abundance of different taxonomic groups, etc. should be shown) was compared to soil C chemistry.

L562-563 This is the first time, as far as I can tell, that the authors attempted to define dispersal limitation. This information needs to be given when this is first mentioned in the manuscript.

L563-L566 How does restrictive movement of microbial communities in space lead to functional redundancy? It seems like this would actually reduce functional redundancy as spatially restricted microbial communities become more specialized over time especially in salinated and non salinated soils which likely has a marked effect on the microbial community structure.

Tables and Graphs

Figure 1. It would be helpful to have a label for the waterway in the right hand side of the bottom panel. I think that is Beaver Creek but unsure. Maybe this tributary to Johns River does not have a name though?

Figure 2 and 3. I recommend color coding the points for each of the three sites so readers can see where they fall out on the regression line.

Table S3 font size should be increased if possible