

Biogeosciences Discuss., referee comment RC2  
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## Comment on bg-2021-318

Anonymous Referee #2

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Referee comment on "Linking sediment biodegradability with its origin in shallow coastal environments" by Justine Louis et al., Biogeosciences Discuss.,  
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"Linking sediment biodegradability with its origin in shallow coastal environments"

The authors aimed in this paper to explain possible factors that drive biodegradability of OM in sediments of Bay and estuaries of Brittany Region. This paper has two parts: the first one, deals with the identification of potential sources of shallow OM through several biomarkers and isotopic signatures.

The second one using short time core's incubations to assess the export of nutrients (P<sub>04</sub> and NH<sub>4</sub>) from the sediment and to calculate a mineralization rate that is used to inform about the degradability of the OM. It was difficult to see the continuity between these two parts is done through data analysis (variance partitioning) and show the significant inputs of several human activities in these basins and bring attention to the potential detrimental role of microorganisms that were not analyzed in this study.

General comments:

With regards of the type of chemical analysis that were measured, bacteria could have been assessed with their typical FA markers for instance. One can imagine that full FA profiles are available for each site since other FA were displayed in this study.

Also, North and south parts of Britany have some abiotic differences, in average the climate is much wetter in the north and the tides are higher than in the south. There is a Channel Britanny and an Atlantic Britanny. These differences will have an impact on coastal and intertidal waters/sediments qualities.

Both sides of the region have experienced large oil spills in the past.

When it comes to OM origin, a one-time sampling at a large scale is not sufficient to conclude on which anthropic source is influencing the most of the OM origin. Local inputs need to be verified. There is nothing new in announcing that natural and anthropic sources are both contributing to the OM composition.

Specific comments

Abstract

L19 I am not convinced about the chosen scale is being "representative" of the complexity of such anthropized region.

M&M

My main issue here, is what it seems to me the wrong definition that authors have of some chosen "estuaries". Two of them are in fact not estuaries = water influenced by both open ocean AND riverine waters. La Rance and Triaux, are Ria with no river influence. Waters in these basins are almost totally under marine influence, "functionally and biologically" they are much close to what happened in a covered bay that in a typical estuary which usually exhibit pronounced salinity gradient.

La Rance is also particular because it bears at its mouth the only and unique hydrothermal barrage of France with the consequence that it controls water entrance and volume (only one tide a day). The local hydrodynamic needs to be well known especially if one need to conclude on its sedimentation rate.

## Discussion

L489 It is a fact that parts of the north coast have been impacted by oil spills.

L495-500: to be rephrased, also not clear if finally, the petroleum inputs have an impact in the "south" sediments.

L515- to be discussed with regards of the local knowledge to the Rance hydrodynamic.

L550-556: Biodegradability or of organic sediment and its consequence, releasing nutrient and greenhouses gases is something well known in coastal ecology with the concept of "priming effect". This priming is indeed triggered by eutrophication (human and animal wastes, included).

L557: More importantly is what leads to increase bacterial activity.

L 619: there an enormous literature of the role of bacteria in the degradation of the OM. Need to be fairly discussed.

L619-622: rather speculative, what about the impact on macrofauna of the induced stress with regards of the short term "in situ" measure ?

To conclude, the two parts of this article are not thoroughly connected, besides, there are shortcomings conclusions in the very descriptive first part: spatiality, potential sources changes, local ecological knowledge...

The second part could stand by itself especially if authors would consider a broader literature.