

## Review “Origin, transport, and retention of fluvial sedimentary organic matter in South Africa’s largest freshwater wetland, Mkhuze Wetland System” by Gensel et al.

### General

The manuscript is generally very well written and focusses on an interesting and important topic, the characterisation of the organic matter input from Mkhuze Wetland System in South African to Lake St. Lucia. The first problem that struck me when reading the introduction was, that aims and questions are very vague., It is not clear what is meant by assessing the status of the wetland (see below). Is the hydroglogical status meant (drained, undrained) or the soil degradation status or the degradation status of OM? Also using  $\delta^{13}\text{C}$  and  $\delta^2\text{H}$  of n-alkanes to characterize sinks and sources is no doubt a fore front method, but for sure not matured enough, to draw conclusions on plant type communities and degradation status of wetlands.

As such, compared to such ambitious aims, the introduction is very general. I totally miss discussion of state of the art on  $\delta^{13}\text{C}$  and  $\delta^2\text{H}$  organic matter tracing and what it can tell us about sinks and sources. The same holds true for stability of n-alkane concentrations when used as indicators for sediment or organic source attribution.

The description of the sampling concept is totally missing. All it states is, that “ten samples where collected.” However, Figure 1 displays around 30 sampling sites, so I assume that ten samples for each sub-environment was taken? This is totally unclear. A detailed map of vegetation communities is presented (Figure 3) but it is not at all clear, if all these communities were sampled as possible sources and if so, how many samples, which plant species etc....If the aim is, to track OM in the lake back to these communities, the detailed sampling scheme has to be described.

The results are mainly a listing of all measurements done with differences in numbers and sizes. There is no real information gain for the reader, as none of these results are set into perspective and the discussion does not give a clear link back to these data descriptions. Not even the indices and parameters used are in any way explained in the results section (and only very briefly in the discussion). Variability and differences are hard to assess, as sampling numbers and possible errors are not described. It is not clear if error bars indicated in-field heterogeneity or analytical uncertainty. Figure 8 states that error bars might be intra-laboratory long-term errors.

The discussion is more a descriptive qualitative narrative of differences found in parameters within and between different sub-ecosystems. Indices for evaluation are not adequately introduced and partly interpreted in a wrong way (e.g., that CN ration of OM would be a general indicator of chemical stability). As such, I can not follow conclusions drawn and can not judge if these conclusions adequately assess the results. One example would be the conclusion “Sedimentary OM in the floodplain and swamp exhibit high variability in their source signatures and degradation status reflecting environmental diversity, with samples from the floodplain characterized by a mixture of degraded OM from the hinterland and fresh OM.”(line 575-577). With clearly high ongoing and very variable degradation of OM in these systems, concentrations of organic substances can not be used as a conservative tracer. Regarding the isotope tracers used, no un-mixing was done and the values were interpreted in a qualitative way, which is, from my perspective not leading to meaningful conclusions.

All in all, I would judge this work as containing highly valuable and interesting data and results. But description of sampling concept is inadequate and interpretation of data is qualitative with numerous assumptions I am not sure can be hold.

## Introduction

Generally, well written and interesting to read about the Mkhuze Wetland System. However the aim of “assessing the current status” is very vague to me (line 36). Which status do you mean? Hydrological? Soil degradation? Nutrient status?

I totally miss discussion of state of the art on  $\delta^{13}\text{C}$  and  $\delta^2\text{H}$  organic matter tracing and what it can tell us about sinks and sources. Also, what about the stability of n-alkane concentrations in these systems? Are you sure you can use these as conservative tracers?

40-42 this assumes that you have species specific tracers

42-45 how can you assess the vegetation type (do you mean plant community?) with  $\delta^{13}\text{C}$  of n-alkanes?

45 hydrological conditions of what? Of the regime under which the plants grew? Of the soil? E.g., wetland, upland, drained? Not sure you can achieve this with  $\delta^2\text{H}$ ?

51 this is a big aim, to the assess the status of the wetland systems in terms of its filter function and influence on Lake St. Lucia!

## Methods

133 what do you mean by “Ten samples were collected.” Of what? Ten repetitions within a site?

137 – 139 these plants were not collected? But all others were? Or these are the ones which you did collect?

Figure 4 is basically describing standard analysis and could be moved to supporting information.

## Results

252 what is HI value?

256 what is R-index?

260 what is I index?

For all errors it is not clear from how many reps they are produced, if repetition at all or if this is analytical error.

## Diskussion and Conclusions

Paragraphs 343 -349 versus 332 – 338: I am not sure I understand you correctly, but this makes not much sense to me. First, you describe the differences in n-alkane patterns within plants, within sites and between different ecosystems, but then you assume that you can take literature values from generally well studied plants, such as trees as source values to be characteristic for your sites?

The discussion in 4.1. mainly compares the n-alkane concentrations determined in this study in comparison to literature values. But what is the message behind this paragraph?

Paragraph 4.2.: what is is this telling me regarding the aim of your study, the status of your system, what is the aim of this paragraph? What is the connection to your results?

369 the C/N ratio is an indicator of chemical stability? I do not think so?

Paragraphs 4.2.1. to 4.2.4. describe the variation of the different measured parameters in each of the sub-ecosystem types and tries to induce state of degradation of OM or plant origin. This discussion is qualitative and not really set in perspective to literature values.

Section 4.3. (line 467 – 480) starts with a general description of Mkhuze Wetland System which might be transferred to the methods or the introduction. Or are these statements conclusion from your data? If so, please make the link to your results.

494 – 499 is this general knowledge of literature or is this a conclusion from your results? Please make the link to your data

Some conclusions might be considered speculative.... e.g., from the result that “....the higher hydrogen isotope signature of the sedimentary n-alkanes in the lake probably resulted from a dominant contribution of lakeshore vegetation” (line 464 – 465) the general conclusion is drawn, that “OM in the surface sediments of Lake St. Lucia originates primarily from lakeshore vegetation” (line 501). There is no unmixing of possible source signatures, no quantitative evaluation. This is just one example, which leaves the impression, that conclusions drawn are based on rather qualitative assumptions and might even be speculative.