

## ***Interactive comment on “Small scale variability of geomorphological settings influences mangrove-derived organic matter export in a tropical bay” by Geraldina Signa et al.***

**Anonymous Referee #1**

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### Comments

The authors of this paper have investigated changes in mangrove outwelling to sea-grass beds and coral reefs over seasons in Gazi Bay, Kenya. Mangrove forests are highly productive-ecosystems and have important implications for the exchange of organic material in the tropical coastal seascape. They have combined more traditional analyses (isotopes) with modern techniques (fatty acids) to explain the source contributions and spatial distribution of organic material across the bay. In addition they also investigated how physical factors such as tidal exchanges, river runoff and season may affect the exchange of organic material between different habitats.

The authors state they have found significant differences in transport of organic mate-

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rial from mangrove forest creeks to adjacent systems. This was primarily due to river runoff and tidal transport. However the river runoff creek was influenced strongly by the rainy season. Interestingly the authors found that macroalgae also had a contribution to organic material, this ecosystem is often ignored in the tropical seascape.

The paper is of an interesting subject with new techniques applied. There is a dearth of data regarding the outwelling of mangroves with physical factors taken into account especially with respect to connectivity. It is quite well written and structured. The abstract and introduction are well done and flow nicely. There are minor comments on these sections. I admire the authors for doing such a thorough job on this study, they have tried to expand our understanding using new techniques in addition they must have worked very hard. It is not easy to complete fieldwork over two seasons and fatty acids are very labor intensive. However, I have some concerns regarding the methodology, results and major concerns (section 4.2) regarding the discussion.

### Methodology

No statistics were used to compare the isotopes sources. This makes it difficult to understand the patterns in the data the authors state. The changes the authors saw in the organic material sources did not seem statistically significant nor could it be shown in the figures. A statistical test would resolve this.

### Results

The figures depicting the results are numerous and difficult to understand. Several of the tables/figures could go into the supplementary section (even though there is already data in this section), other figures need to be edited for clarity and others could be drastically improved by a different method of illustrating them. Several issues in the discussion may be due to the difficulty in understanding the figures. In addition I and I think others would find it easier if at some points the authors specified which creek applied to transects A and B, it was annoying to keep on referring to the methodology to understand which was which.

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For example, section 3.1.2, line 7- I am not sure if “often” is the correct word to use. They seemed to be almost always overlapping.

Table 1 and 2 could go in the supplementary material. Table 1 especially should be in the supplementary material.

Figure 1 is badly drawn. The labels for the ecosystems do not seem to correspond to where the ecosystems are although I understand that the authors found it difficult to place them on the actual systems. The map looks amateurish.

Figure 2 is a very difficult figure to understand at first glance. For example if mangrove leaves are a source (symbol is a cross) then why are they not decreasing in size similar to the other sources? In addition the symbols decreasing in size do not help comprehension of the figure. This information may be better shown in a table.

Figure 4 and 5. Could this be done better as a percentage column graph? From my comments on the discussion, I found it difficult to see the patterns the authors stated were there.

Figure 6, should either be deleted, put into a table or put into the supplementary material.

#### Discussion

In the first section (4.1) of the discussion the authors state (pg 11 Line 2-5) that the depleted  $^{13}\text{C}$  in seagrasses and macroalgae could be due to the different physical settings of the two creeks. The depleted  $^{13}\text{C}$  in seagrasses and macroalgae is also referred to in the results but I cannot see how this can be inferred by the associated figure. The explanation is plausible but I cannot see the evidence from the data the authors refer to. It would be easier to understand if this figure (fig.2) was represented in a table.

Section 4.2 states that mangrove derived material from Kinondo Creek greatly contributed to the sedimentary pool and moving seaward decreased its contribution until

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dropping steeply in the coral reef. This is true for fatty acids (fig. 7) but I cannot see from the isotopes (fig. 4 and 5) how the authors came to this conclusion. In transect B (Kinondo Creek), mangrove derived material does contribute to the sediment although I would not state it contributed the most nor does it decrease from mangrove forests to seagrass beds, at some points it increased its contribution! However the authors are correct in that its contribution steeply drops off at the coral reef. The authors also state that the transect A, due to the influx of freshwater the export of mangrove derived material is further and indicates a significant contribution to the whole bay. Again this explanation is plausible and the authors place their explanation well within the known literature. But if Figure 4 and 5, which are suppose to represent this pattern, they do not show this. Considering that the authors state that there is a difference between the creeks, I cannot see a statistical significant difference between the two transects from the figures. However their explanation is plausible and I wonder if the wrong data is being shown? The fatty acids do confirm the authors explanation, not the isotopes.

Section 4.2 (pg 12, lines 7-9), the authors should include a line or two regarding seasonal changes in litter fall. *Avicennia* sp. in Brazil will lose their leaves only directly between seasons whilst *Rhizophora* sp. have leaf fall continuously over the seasons.

All other comments for the discussion are minor.

#### Minor comments

Pg 2, line 20. Hemminga et al. 1994 is a eminent paper but not a recent one.

Line 26. Wave power is not the correct word to use here.

Pg 3, line 6-10. Nitrogen isotopes are also used and should be mentioned here.

Line 23, A reference should be given for rainfall magnitude.

Pg 4, line 19. What is the depth of the coral reef?

Line 23. “unless low groundwater discharge” please re-write for clarity.

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Line 24. What are the high flow rates?

Line 27. "ones" is not a scientific word.

Pg 5, line 2 "one" not a scientific word.

Line 8. "ones" not a scientific word.

Line 14. How much volume of sediment was collected in the cores?

Line 15. How were the seagrass leaves and macroalgae sampled, plucked?

Line 18. How were the samples kept cool and dark before arrival?

Line 27. What type of micro mill was it?

Pg 6, line 6. The equation could be presented much more clearly.

Line 10. I cannot understand what you did from this sentence.

Line 25. Why did you not also look at terrestrial sources, two lines in the introduction should provide some justification for not using terrestrial sources.

Pg 11, line 19. Do you mean the transects when you state "stations".

Pg 12, line 21. When was the timing of the other studies?

Line 22-25. I find this line confusing and had to read it several times to understand what the authors were meaning.

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