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Comment

Interactive comment on “Mangroves in peril: unprecedented degradation rates of peri-urban mangroves in Kenya” by J. O. Bosire et al.

Anonymous Referee #3

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This is an interesting study that documents rates of degradation in two peri-urban mangrove stands near Mombasa, Kenya. The authors demonstrate that degradation rates in these two stands have been much higher than the global mean or Kenyan national mean. These results suggest that there is variability in local degradation rates of Kenyan mangroves. These findings have important implications for the management of mangrove forests in this part of Kenya. The authors' methods appear sound. However, there are a number of major issues that would need to be addressed before this manuscript would be suitable for publication in Biogeosciences. Specifically, the main conclusion is unsubstantiated, the drivers of the observed losses in mangrove cover are not adequately discussed, and there are numerous grammatical errors.

Major comments.

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The conclusion that peri-urban mangroves in Kenya are generally experiencing greater degradation rates than the global or countrywide average is unsubstantiated. In the first line of the Discussion, the authors state that the goal of the study is “to investigate the hypothesis that peri-urban mangroves are experiencing higher degradation rates far exceeding the global mean of 1–2% pa commonly reported in literature.” However, the authors only examine 2 stands of mangroves in the same region of Kenya, and no evidence is given to support the argument that these results can be extrapolated to peri-urban mangroves in other parts of Kenya, much less the world. The very high levels of deforestation documented by this study could be a local-scale phenomenon. The authors should change the description of their main goal in the Abstract, Introduction, and Discussion or provide evidence that these deforestation rates are typical of peri-urban mangroves across Kenya.

The evaluation and discussion of the drivers of mangrove losses in the study area is inadequate. For example, in p. 16385, lines 17-21 the authors attribute the higher loss of mangroves in Tudor as compared to Mwache “to indiscriminate and uncontrolled harvesting, pollution from industrial and domestic sewage discharge and aggravated siltation, among other anthropogenic factors which are prominent in this forest”. However, most of these factors are not examined. The authors argue that mangroves in Tudor experienced indiscriminate and uncontrolled harvesting while mangroves in Mwached experienced selective harvesting based on size class distributions and observations of illicit distillers in Tudor, but none of the other mechanisms are addressed. The authors also imply that IOD events cause mangrove mortality, but don’t discuss the mechanisms by which this occurs or the spatial scale of this mortality. In p. 13386, lines 17-21 the authors suggest that *Avicennia marina* cover has increased due to its tolerance for a wide range of environmental conditions, but again do not describe the environmental factors that would allow *Avicennia* to outcompete other species. Finally, there is no discussion of whether the drivers of mangrove degradation in Tudor and Mwache apply to other peri-urban mangroves in Kenya.

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Throughout the Abstract and Introduction the term “degradation” is used in reference to mangroves. To me, degradation suggests that mangroves may be experiencing reductions in quality as well as outright mortality. However, the manuscript appears to only address deforestation (both anthropogenic deforestation and, briefly, climate-induced mortality). Is there evidence that mangroves in the study area are experiencing other forms of degradation (e.g. reduced growth rates, lower reproductive output)? If so these types of degradation should be addressed in the Introduction and Discussion. In any case, the term “degradation” is vague, and should be clarified in the Introduction.

There are problems with wording and sentence structure throughout the manuscript, especially in the Introduction section. I’ve identified many of the major errors in the detailed comments (see below), but the manuscript would benefit from an additional thorough round of grammatical edits.

Detailed comments.

Introduction. Define “peri-urban”.

p. 16372, line 1. Change “unprecedentedly high” to “higher”

p. 16372, line 20. Remove “had”

p. 16373, lines 24-27. This sentence does not make sense as it is currently worded. It seems that the authors are implying that the IOD events of 1997/1998 and 2006 are associated with climate change, however this connection is not supported. Is there evidence that climate change will change the frequency or intensity of IOD events?

p. 16374, line 17. Do the authors mean developing band ratios when they say “band rationing”?

p. 16374, line 28. Global estimates are not masking local rates, they are just not capturing local scale variability in those rates.

p. 16375, line 5. Complacency would be unwarranted, not inadequate. Reword this

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sentence.

p. 16375, line 13. “Heavily impacted” is vague, what are the impacts?

p. 16376, line 6. What is the zonation pattern?

p. 16376, line 24. SPOT images cannot be unsupervised, however classifications of images can be unsupervised.

p. 16381, line 20. It is unclear what is meant by “not in the same spatial variability”.

p. 16385, line 10. Vague, what are the specific threats related to climate change?

p. 16385, lines 18-21. The authors imply that harvesting, pollution from industrial and domestic sewage discharge, aggravated siltation, and other anthropogenic factors are greater in Tudor than Mwache. What is the evidence for this? The Mohamed et al 2008 reference was not listed in the References section and so I could not check to see if this paper supported all of these claims. In any case, provide a more comprehensive discussion of the differences in these drivers between Tudor and Mwache. Also, “other anthropogenic factors” is too vague. All of the factors should be listed and discussed.

p. 16385, line 18-21. This sentence needs to be reworded

p. 16385, line 21. “is” should be changed to “was”.

p. 16385, line 22. Include a discussion of how IOD events cause mangrove loss. What are the mechanisms?

p. 16385, line 25-29. This sentence is unclear.

p. 16386, lines 1-11. How can we be sure that differences in mangrove structure between mangroves in this study and mangroves in other parts of Kenya are due solely to anthropogenic pressure and not variability in climate or environment (freshwater availability, soil quality, salinity, etc.)?

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