

Reviewer: Sarah Ivory, Brown University

General Comments:

The manuscript of Bouimetarhan *et al* is an interesting look at vegetation changes in a data poor area of the tropics which has important implications for better understanding long term ecosystem dynamics as well as tropical vegetation-climate interactions. Pollen records in the tropics are rare but essential for understanding both tropical climate change and landscape evolution outside of the modern. Furthermore, very little work has been conducted over that time scale from the marine realm and particularly in evaluating changes in sensitive salt marsh and mangrove communities. Thus I feel that utilizing this record is a clever way of looking at an understudied system in the past.

Although the main findings of this study of great interest, I find that there are a few problems that should be addressed throughout the paper. In particular, I thought the most novel findings in this paper are the implications for coastal processes and ecosystems, rather than the broader regional paleoclimate synthesis. I don't think the paleoclimatic implications should be removed; however, I suggest a few changes to focus more strongly on these important and rare ecological insights.

Specific Comments:

Abstract, Line 12, This sentence is a little confusing. I think the link the author is trying to make is a teleconnection between "arid" conditions in East Africa and cool northern hemisphere temperatures. This might be rephrased to show that. Also the term "dry spell" seems very colloquial, might change that to "arid period". This change should be made also for other instances of "dry spell" and "cold spell" in the paper.

Page 3933 Line 17, The author mentions that we don't really have a sense of what is influencing rainfall variability, then says that Indian Ocean SSTs are dominant on long time scales. I would back off a little on that, because it seems like the author is setting up a strawman or already making a conclusion on the most important mechanism in a very complex system. Another thing is that here the author compares the mechanisms controlling *millennial* scale variability in North Africa with those on all time scales in East Africa. Maybe just cite the mechanisms we think may influence rainfall in East Africa on millennial time scales here for consistency.

Page 3934 Line 9, The author says that there is no consensus about which definitive climatic pattern is related to vegetation change, but around Line 15, only one mechanism is mentioned (ie North Atlantic climatic perturbations). I feel like the author is trying to find a reason to convince people that marine records have some advantages over terrestrial records, which I completely agree with, but I wonder if this is the best way to do it. I don't see how one extra record, just because its marine, has the power to resolve all of the complexity about East African climate. The author talks in the abstract about being able to observe coastal processes and also mangrove changes. This to me seems like the real advantage of this record, that virtually no one has looked at coastal vegetation changes in the region. East African coastal vegetation is a major biodiversity hotspot (Myers, 2000), plus mangroves are very important

ecosystem that have not been intensively studied, so I think you could focus your justification for the project more in ecological terms than in climatic terms. This is just a suggestion, but I think focusing on the ecological implications rather than the climatic ones would highlight the real reasons this paper is cool and interesting! Also it may be of use to do a little comparison with other mangrove systems that have been looked at in paleo-studies. Anne-Marie Lezine has looked at Holocene age mangroves in Oman and there are a few other records from that region. They are more recent in age, but talk about some of the eustatic and local processes involved in expansion and collapse of these systems.

Page 3938 line 15, How were the pollen abundances calculated (ie. Including or excluding aquatics and Cyperaceae and mangrove taxa)? I just noticed that the author does state the mangrove is excluded later in the article. This might be relevant to mention in the methods.

Page 3937 end of page, what is the interpretation of Al/Ca and why was this selected? Some interpretation of this proxy is needed.

Page 3936 Line 17 – what is the temporal resolution?

Page 3939 Line 10 – If most pollen is delivered via fluvial transport, how do variations in transport potentially influence your record? It seems like your high pollen concentrations occur mostly when you have higher sedimentation rates? Is that the case? A sentence about this might be good to include.

Page 3939 Line 15 – Most of this Results text should be in past tense when talking about events that happened in the past.

Page 3941 line 14, Is there a sense of how much 80-120m sea level change would affect the proximity of the core site to the coast?

Page 3942 Line 24, reference for “Afromontane forest mainly developed in mountains favoured by cold and humid conditions.” Is this based on knowledge of the environmental tolerance for these plants or correlation to a paleoclimatic record?

Page 3947 line 13 The author mentioned earlier in the paper that some of the vegetation changes (lowering of afromontane vegetation) may also be linked to temperature, not just precipitation.

Table 1. The author lists *Artemisia* as a common Somali-Masai taxon in the description of the modern vegetation, but in this table you have it listed as Afromontane. Since your record integrates lowland and highland, it may be the case that it is difficult to say whether *Artemisia* here represents arid lowland vegetation or is part of the montane assemblages.

Figure 6. I found this figure confusing, because you include forest and dry woodland percentages twice (calculated in two different ways). Perhaps, it might be better to simplify this by only including these groups once using the percentage calculation without aquatics and mangrove.

Technical Corrections:

Abstract, Line 18 “consisting of well-developed salt...”

Page 3933 Line 2 “Climate and rainfall fluctuations” Do you mean temperature and rainfall fluctuations?

Page 3934 Line 6, remove “allow obtaining information about”

Page 3941 line 18 “southwestern”

Page 3942 line 2, “is likely the result of changes in local hydrologic conditions through...”

Page 3942 line 10 “*Rhizophora* pollen maximum” since its singular

Page 3942, line 27, “Therefore, the high abundances of the afro-montane forest in the marine pollen record corroborates...”

Page 3943 line 18 “dry woodlands and shrublands”. Same change should be made for the rest of paper, figures and figure captions.