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Discussions

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Interactive comment on "Extreme flood events reconstruction during the last century in the El Bibane lagoon (Southeast of Tunisia): A Multi-proxy Approach" *by* A. Affouri et al.

Anonymous Referee #2

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General Comments

The paper shows that this site has the potential for developing reconstructions of past flood events, as demonstrated by the correspondence between silt layers and twentieth century flood/precipitation events. It is really showing the potential for future reconstructions, rather than giving new data at the moment.

I think the paper could do more to emphasise the importance of the work. At the moment the abstract finishes with a statement that hydrological events can be reconstructed using sedimentary archives, which has already been shown elsewhere. Instead I would like to see more emphasis in the introduction, discussion and conclusion about what the wider implications are and why this site in particular may be important.

For example: saying whether there are other reconstructions from this region that have reconstructed hydrological changes – and if not, highlighting that the paper shows that this site has the potential to provide this, which could answer questions on the recurrence intervals, magnitude changes etc...

The manuscript organisation needs improving, as there is some mixing of results, interpretation and discussion, which make it quite confusing at times.

In addition I feel the English needs better proof reading before publication to ensure it reads well. I have made some changes to this but not throughout.

Finally there are too many figures and some seem unnecessary so should be combined or removed.

Specific comments

Page 2, line 13 – maybe add here about what we can understand from geologic archives, for example the frequency, magnitude, patterns of events etc...

Page 3, line 1-3 – this should not be a paragraph on its own, so either remove or merge with previous paragraph

Page 3, line 17 – maybe use the word 'partially' before 'separated from the med...', as it looks on the map to not be completely separate.

Page 3, line 18 – are both peninsulas 12 km, make it clear if this is the combined length or not

Page 4 – there is an extensive geological description here which I am not sure is necessary. I think cut this down and make it more clear which parts are likely to influence the watershed of the lagoon, and the area on which it is situated.

Page 5, line 14-15 – this says that figure 3 shows that the precipitation events caused the flood events, however it only shows the precipitation records with no link to flooding. Remove the final part 'causing the flood events' or give more evidence.

Page 7, paragraph 1 – make this paragraph about the dating into a sub section on its own because it doesn't fit in this one about the proxies used. I am not familiar with what 210Pbex is and I think it might be better to refer to it as simply Pb210, as you do in the rest of the paper. If it is necessary it should maybe be defined when it is first mentioned.

Page 7, paragraph 2 – as you just used PCA it might be better to start the paragraph with 'Principle Component Analysis was used to understand the relationship....' because this makes the link with what you say in the next sentence. I would also merge the last two sentences in this paragraph.

Page 7, paragraph 3 – the first sentence suggests that you have made the measurements and then grouped them into 3 source areas, whereas I think you have actually taken samples from three different types of location and then present the characteristics of these. Change this first sentence to make it clear that this is what you did.

Page 9, paragraph 1 – in the first two sentences you have used 'sediment' in each and then described three different origins – make it clear which sediment you are describing. I think in the first sentence you mean the lagoon sediment and in the second sentence perhaps terrestrial sediment, but I am not sure. So make this clear and also reference each sentence. Is the third sentence about ionic radius important to know for understanding the results? I think it needs removing. Finally, the last sentence repeats the results from section 5.1.1., so I think that you could delete lines 11 and 12 (ending the sentence with 'observations') and in brackets put 'see 5.1.1'.

Page 9, paragraph 2 – the sentence about detrital quartz (line 18-19) does not fit in here and should be removed. The end of the paragraph from line 18-22 is also more of an interpretation and doesn't belong here in the results. Also would need to reference line 20.

Page 10, paragraph 1 – first sentence should be in the materials section, as it is about collecting the core – or delete this if it is already described in the methods. The fi-

nal sentence in this paragraph is an interpretation, and I think would go better in an interpretation section.

Page 10, paragraph 2 – I don't think you should chose a Pb210 model based on the downcore distribution of Pb activity (and Pb210 activity often has exponential curve), I think it should be based on understanding of the deposition at the site, for example I think the CF:CS model assumes constant sedimentation, whereas the CRS model does not. Look at the assumptions of this model and then justify it in the methods section, and also make sure that this is referenced as it is not here. In line 10 you say the range is down to 0.1, but in table 3 the lowest is 1.058. Also the Pb210 profile in figure 10 shows a big gap between 21 and 40 cm with no samples dated – would it be possible to date between these? Without these depths you are not able to show where the equilibrium depth is (where Pb210 activity is around 0). I know that having this depth is important for the CRS model – I am not familiar with the CF:CS model so it may be different, but if possible further dates would help constrain the timing of the lowest flood layer.

Page 11, paragraph 1 – I would remove this section completely and move most of it (line 4-17) to the results (put it in section 5.1.2). The order of the figures would then also change.

Page 12, lines 1-9 – the term 'continental source' appears here and it is unclear what this describes, as previously only marine, fluvial and aeolian sources are described. Either change it or explain what is meant. Also what is meant by 'continental pole' and 'marine pole' is unclear, maybe use the 'sediments' or 'sources' instead of 'pole'.

Page 12, section 6.3 – I think it would help to have a paragraph or a few sentences at the start of this section clarifying the link between the sediment source characteristics and the sediment changes in the lake sediments. For example say that as the sediment from fluvial source was high in X,X,X then these characteristics in the core sediment will be used as a basis for interpreting flood events.

Page 13, line 2 - remove this sentence as it repeats the previous one.

Page 13, line 5-6 – I also feel this sentence is repetitive and has no reference, so should be removed

Page 12 and 13 - This is a very long paragraph so I would split it into three, with new paragraphs at page 12 line 23 ('From our age model...'), at page 13 line 6 ('Using the same approach') and page 13 line 14 ('Finally')

Page 13, line 11-13 – I am unclear what is meant by 'most of the sediments'. Did these studies show that sediment deposits were left by the 1969 event in particular? It is also not clear which event is being referred to as the latter event, so make it clear which it is.

Page 13, line 17-19 – I agree with this statement about the constraints on your pb210 dating, but maybe acknowledge this sooner in the results section

Figure 1 and 2: these could be combined, as the geological map could be put in place of the lower map on figure 1 which spans the same area and doesn't show much additional information.

Figure 5: This is interesting but I think it may not be important enough to require a figure. There are a lot of figures, so this might be one to remove. Also the figure caption refers to samples which are not shown on the figure (e.g.S4) so these should not be mentioned.

Figure 7 and 8: it is clear from the graph that the values are percentages, so remove this from the caption. These two figures could be combined, as they show the same type of data.

Figure 11 and 12: these are important for the interpretation so I think these figures should come earlier (before the figure 9 and 10 showing the core results). I think if the PCA section is moved to 5.1.2 as I suggest above then this should come forward, and figure 12 could also be introduced there as well. The paper might read better if there

is a clear first part looking at the catchment sources, followed by the results from the core.

Figure 13: this compares the precipitation and sediment cores using both depth and age. I understand that the pb210 model is not perfect but it might be better to have an additional x-axis on the top graph showing the estimated age, or at least ages marked on at the boundaries of the flood periods so that you can see the timings of these just by looking at the figure without needing to read the caption. Also, in black and white the bar for FL1 does not show up well.

Table 1: this could go in supplementary information. It is clear on figure 4 where they are all located and in the next table you state the type of locality they are.

Technical corrections

Page 1:

Title – 'spanning' might be better word than 'during'. Also, there is an uneven use of capital letters.

Line 10 – flood not floods

Line 11 – 'Recent studies of' not 'Recently, study of'

L12 – 'have enhanced' not 'contributed to enhance'

L14 – I think it should be 'multi-proxy approach' not 'multi-approach'. Also rethink word 'associating' and maybe use 'combining'

L16 – change to 'sediment deposits'

L17 – remove 's' at end of sediments

L22 – 'flood' not 'floods'

L23 – Chronology should not have a capital letter

L22 and L23 – merge these sentences perhaps '...137Cs chronology, and give ages of AD 1995....'

Page 2:

L1 and L2 – remove first half of sentence maybe up until suggests and then merge with previous sentence, as the part starting 'Such a good correlation...' is repeating the previous sentence

L3 – maybe add 'in this location' after 'possible' because this does not prove that this method would work everywhere. Also, 'rendered' is not necessary.

L12 – 'flood events'

Page 3:

L5 – either south of Tunisia, or Southern Tunisia

L5 to L11 – description of aims needs rewording. For example, say 'The first aim of this research was to identify...' not 'First aims'. You could also call them 'stages' rather than aims. I think the part about the Pb and Cs dating methods is not needed here.

L14 – remove word 'which' and there is no need for the first 'km'

L15 - add 'and' after axis and remove word 'up'. Km should not be capitalised. Add 'a' before 6m

L20 – is the word 'slobs' the technical word or a local word. If it is local maybe use word peninsula

Page 4:

L1 – L3 – merge these two sentences perhaps. Also change to 'has low demographic pressure'

Page 5:

C7

L4 and L5 – reference these two weather facts. I also do not understand the term 'unequally spatiotemporal repartition' so maybe consider changing

L7 – change to 'is concentrated within 30 days/yr (...'

L8 – typo of Mars not March

L8 – change to 'while in the summer months there are drought conditions'

L10- L13 – Merge first two sentences of this paragraph. Maybe move 'obtained from the Directorate Reseach of Water Resource (ref)' to follow watershed in line 10 and remove rest of the second sentence.

L15 – change to 'precipitation events' not 'precipitations'

L16-17 – the sentence beginning 'During flood events...' needs a reference

Page 6:

L7 – be careful of the spacing between the sample names

L12 – add 'a' before combination

L13-15 – It might be better to merge these two sentences that describe the XRF analysis

Page 9:

L10 – do you mean microscope rather than binocular?

L17 – remove 'of the southern Tunisia' because you are referring to your samples rather than the wider region.

Page 10:

L12 – use 'Constant Flux: Constant Supply (CF:CS)...', so capitalise it and add brackets

Page 11:

L20 – 'To precise the modern contribution of these...' doesn't make sense so reword

L21 – change 'Lagoon' to lagoon

L23 – remove 'South-eastern Tunisia' as you are considering the sanddunes close to your site rather than those throughout this part of Tunisia.

L24 – instead of 'cf chapt 5.1.1' put 'see section 5.1.1.' Page 12:

L2 – be consistent in use of either Fe or Iron. Merge sentences on L1 and L2 Page 13:

L16 – give reference or refer to a figure if it is shown in one.

L24 – use different term than 'heavily precipitating events' e.g. high intensity precipitation events

L 25 – use 'Furthermore' rather than 'on the other hand', as you are not contradicting yourself but rather making another point.

Page 14:

L8 – change to 'discriminate between the...'

L15 – reconsider phrasing of 'have permitted to identify', maybe 'have allowed us to identify'