UNIVERSITÉ DE STRASBOURG

IPGS Institut de Physique du Globe de Strasbourg

cnrs dépasser les frontières

ECOLE ET OBSERVATOIRE DES SCIENCES DE LA TERRE
INSTITUT DE PHYSIQUE DU GLOBE DE STRASBOURG (UMR 7516)

Strasbourg 12 June 2018

To the Editor of
Natural Hazard and Earth System Sciences

Dear Editor,

Please find attached the reply to RC1 (R. Paris), RC2 (P. Costa) and RC3 (C. J. Dabrio Gonzalez) on our manuscript **nhess-2018-62** titled "Paleotsunami deposits along the coast of Egypt correlate with historical earthquake records of eastern Mediterranean.

We are grateful to all three referees that helped us to clarify our text and figures and improve the presentation of our article. All comments, remarks and questions of each referee (and related annotations in manuscript) are addressed in our revised version (see underlined sections in article) and a detailed answer has been prepared in order to clarify the article (see attached sheets).

RC1 (R. Paris) request mainly a rewrite and update of some sections related with the criteria used for the identification of tsunami deposits, and to avoid using the term "tsunami" in some early sections. We use now throughout the manuscript"*high energy sedimentary deposits*" until section 6, revised indicated sections that concern the reworking of sediment (and ages) with emphasis on the role of erosion, and reorganized the text in moving sentences and some paragraphs to the discussion section. All answers to comments and remarks of RC1 are in the attached separate sheet.

RC2 (P. Costa) refer to several major issues of the manuscripts and we have addressed each one of them in details. Although the referee made numerous harsh remarks with rather severe conclusions regarding our data analysis and interpretations, we have found no difficulty in addressing his questions. The majority of his ten main comments are similar to those of RC1, e.g., moving sentences and some paragraphs to discussion, and using *high energy sedimentary deposits* instead of tsunami deposits (see table in separate sheet). RC1 found our list of references poor and outdated and we have added 16 new references (see underlined) and among them 8 are post-2010. RC2 apparently does not appreciate our data analysis and interpretations but we have addressed all his issues in order to clarify the correlation we make with historical earthquake tsunamis in the East Mediterranean. All answers to comments and remarks of RC2 are in the attached separate sheet.

RC3 (C. J. Dabrio Gonzalez) consist in remarks and questions added directly in the annotated manuscript (in a separate file). The referee asked for many detailed explanations that helped in the text and figure clarifications. Among them, the Bayesian analysis of data that provide a useful probability density function for the inferred ages of past tsunamis, and that allows a more correct correlation with historical catalogues. All answers to comments and remarks of RC3 are in the attached separate sheet.

We hope that with the detailed replies to referees, this revised version of article **nhess-2018-62** will be considered for publication.

Sincerely,

Prof. MustaphaMeghraoui (m.meghraoui@unistra.fr)
(on behalf of the coauthors)

Reply to **RC1** 'Comments on NHESS 2018-62', by Raphael Paris

Section 1 main comments

COMMENT #1:
All section on the criteria used for identifying the tsunami units (lines 178-195) is not well-written and should be updated. Many recent references are missing (e.g. references on the 2011 Japan tsunami).
AUTHORS REPLY
This section is significantly revised. In order to clarify the text we have rewritten large sections of the paragraph (see underlined) and added four new references (Lionello et al., 2006; Morton et al., 2007; Costa et al., 2014; and Matsumoto et al., 2016) dedicated to the tsunami identification. The updated specific lines for the criteria are in 188-208. Among 16 newly added references (see underlined), 5 are related to the tsunami deposits following the 2004 Sumatra and 2011 Tohoku earhquakes.

COMMENT #2:
The vertical trends of grain size (and sorting), organic matter, and magnetic susceptibility are not enough described and should be discussed in more details.
AUTHORS REPLY
For this issue, we add more details on the grain size (and sorting) distribution, organic matter, and bulk mineralogy in the supplementary material including grain size and sorting analysis (Tables S1-S24, Figs.S4-S27) at lines 113 -116 & 233-246.

COMMENT #3:
Organization of the manuscript: Many sentences or paragraphs that appear in the results should move to the discussion (see my suggestions in the file attached). Section 6 could be the first section of the discussion. In general, this discussion should be better organized.
AUTHORS REPLY
As also requested by other reviewers, we moved several sentences and paragraphs to discussion section, and re-organized section 6 according to the annotated manuscripts (see underlined paragraphs).

COMMENT #4:
I would avoid using the term "tsunami" in the description of the cores (results). It's an interpretation that has to be argumented later in the discussion. Improving your introduction on the tsunami deposits (see my comment below) will help you better argumenting the tsunami interpretation.
AUTHORS REPLY
Except in discussion and conclusions, we have changed "tsunami deposits" in all manuscript and used instead "high energy sedimentary layers" until section 6.

COMMENT #5:
There is a clear inconsistency of the ages, depending on the type of sample (e.g. shells or charcoals) and degree of reworking of the sediments. When trying to explain these inconsistencies, you have underestimated the power of erosion and reworking of the sedimentary system by a large tsunami. Erosion of underlying soils and lagoon sediments by the tsunami might explain some ages older than expected, especially for the bioclasts (shells) that perhaps are remobilised by the tsunami from older formations (e.g. old marine terrace reworked by tsunami).
AUTHORS REPLY

In order to clarify the signification of the obtained ages, we have changed and added sentences with more explanations from line 564 to 588, also noting in particular the role of erosion during large earthquake tsunamis on the inconsistency of dated samples (line 579-580).

COMMENT #6:
In the conclusion, there is an attempt to correlate the characteristics of tsunami deposits with the location and magnitude of the earthquakes. It's extremely difficult to correlate the thickness of tsunami deposits with the proximity and/or magnitude of the seismic rupture. If you want to discuss this issue, it has to be developed and better justified.
AUTHORS REPLY
We agree with the reviewer comment and removed the lines 589 to 593. However, we leave an inference on the proximity of tsunami sources and tsunami layers (lines 617 – 624). In order to properly describe the spatial distribution of tsunami deposits (and perhaps infer their size), more investigated sites with more trenches and cores are indeed needed.

COMMENT #7:
Some comments on the tables and figures
a-Table 2a: It's hard to get how samples are ordered here. Re-order them by date and site by site? Table 2b: same remark as for table 2a + distinguish charcoals, bones and shells. 30 ages are presented in the table, but only 26 are shown on the cores.
b-Fig 4: add depth of samples, and modify Kafr (Kefr).
AUTHORS REPLY
The missed two ages are dates from test pits (not from cores) in the El Alamein site.
The dated samples of core 6/1sa1 and core 7/sa1 are missing in core figures; they are added with the missing others two ages in supplementary material (it will be 28 samples).
As requested, we have arranged the dates, and in Table 2a we use white background color for charcoal and grey for shell ages. For Table 2b we use white background color for charcoal, dark grey for bones, grey for shells, and light grey for roots ages (lines 910-945).
b-Fig 4: We have added depth of samples, and modified Kafr in Kefr.

COMMENT Fig 5: The symbol used for pointing tsunami events is not appropriate and is not mentioned in the legend. That would be nice to have distinct symbols for dated charcoals and dated shells (on all figures).
AUTHORS REPLY
Figure 4 is updated and for figure 5 a, we use arrows instead of hand to point the high energy sedimentary layers with distinct the symbols for dated charcoal and dated shells.

COMMENT #8:
The manuscript needs proofreading. There are several mistakes and misspellings and the work will benefit from the input of a English native speaker. There are parts that are just to wordy and redundant.
AUTHORS REPLY
The proofreading of manuscript for English syntax and grammar has been done.

Section 2: Comments of RC1 in the text changes in manuscript and the authors changes in text:

No.	Lines edit	Pervious manuscript	Reserved manuscript	New edit lines	Comments
1	82	nearby coastline	omitted	83	C: What do you mean with nearby? if it's generated from the Nile Delta, it's really proximal. R: We removed the expression nearby coastline
2	100	geochemical analysis	textural, geochemical analysis	112	
3	120	west	western	134	
4	116	(born 325 -330, died c. 391 – 400	omitted	-	C: omit R : done
5	127-128	Abu-El Fida (1907) reported in 1329 that the Alexandria city and Nile delta were flooded	Abu-El Fida (1907) reported that the Alexandria city and Nile delta were flooded in 1329	139-140	
6	136	wave	waves	147	
7	136	quays	docks	147	
8	138	felt shaking	shaking felt	149	
9	152	of	for	162	
10	153-159			165	C: Any bibliographic reference? R: we added Sayed 2013 which is PhD thesis
11	164	weathered	eroded	175	
12	166-167			172-173	C: move this sentence to beginning of the paragraph R: it is moved
13	174-176			185-187	C: Uncorrect sentence. Please rephrase. R: it was rephrased see line 185-187
14	181	with	of	192	
15	181	that include	such as	192	
16	184	erosion of lagoon deposits	erosion of lagoon and soil deposits	196	

17	185-195			188-208	C: All this section on the criteria used for identifying the tsunami units is not well-written and should be updated. Many recent references are missing. R: updated with new references (188-208)
18	193			557-563	C: The low peaks of MS obszeerved by Font et al. (2010) are in contradiction with the peaks of heavy minerals and the high values of MS obtained in your study. See my remark at line 437. It would be nice to discuss this issue. R: We discuss this part in lines 557-563
19	207	used methods	Methods used	220	
20	208	The trench size is ~2 x 1	The trench size is typically ~2 x 1	221	
21	209	and	that	222	
22	210			223	C: what kind of core ? R: conventional corning
23	210-212			223-224	C: Rephrase? R: done
24	222		, and	236	
25	220-221		( )	240	C :add two brackets ? R:done
26	225			237-239	C: This sentence is not useful. This kind of information could appear in the figure caption only. R: We rearranged the paragraphs again and I add some details of grain size and put it in useful sequence.
27	227	are	was	247	
28	229	coherency	coherence	249	
29	238	Description of trenches	Description of	258	C: It's not only

		and cores sedimentary layers	exposed trenches and cores penetrated with C14 dating of sedimentary layers		descriptive R: We add C14 dating in the title
20	246	are 20 to 40 meters distance	are 40 to 154 meters distance from shoreline	266-267	C: revise English R: We corrected this lines
21	254 - 257			553-555	C: moved to Discussion? R: moved with rephrased
22	268-270			553-556	C: move to Discussion? R: moved
23	278-288	The Oxcal dating simulation provides the 137 – 422 AD bracket of the white sandy layer unit that may be correlated with the tsunami deposits of the 21 July 365 earthquake (Fig. 4).			C: move to Disscusion or section 6 R: We removed it because repeated in section 6 in lines 508-511
24	281-288			519-528	C: discussion or section 6? R: We moved it to section 6
25	313-317	We interpret this layer as of tsunami origin and although its stratigraphy is located close to the surface, the mixed and reworked sedimentation explains the obtained old age 13985- 14415 BC (Table 2b). The second sample is a rodent bone at 50 cm depth and provides 403-603 AD calibrated age that postdate a catastrophic layer made of white sandy layer with broken shells. This catastrophic layer may correlate well with the 365 AD major earthquake of the eastern Mediterranean (313-317).	omitted		C: move to Discussion R: omitted because it is repeated in the section 6 in 504-510

26	97	Paleotsuanmi	high energy sedimentary	109	Comment in line 320 C:It has to be clear if you already consider that the units are tsunami units at this stage of the paper. Sometimes you write "conspicious layer" instead of tsunami. Be coherent. I would avoid using the term "tsunami" in the descirption of the cores. It's an interpretation. R: We change here all tsunami layers to high energy sedimentary layers
	235	tsunami	high energy sedimentary	255	
	261	tsunami	high energy sedimentary	278	
	298	tsunami	high energy sedimentary	306	
	307	tsunami	high energy sedimentary	316	
	320	tsunami	high energy sedimentary	324	
	320	tsunami	omit	325	
	327	tsunami	high energy sedimentary	332	
	329	tsunami	high energy sedimentary	334	
	333	tsunami	high energy sedimentary	338	
	333, 337	tsunami	omit	340,344	
	341	tsunami	high energy sedimentary	348	
	344	tsunami	high energy sedimentary	352	
	345	tsunami	omit	353	
	346	tsunami	omit	355	
	350	tsunami	high energy sedimentary	358	
	355	tsunami	high energy sedimentary	363	
	357	tsunami	high energy sedimentary	365	
	359	tsunami	high energy sedimentary	367	
	359	tsunami	omit	367	
	361	tsunami	omit	369	
	363	tsunami	omit	371	
	369	tsunami	high energy sedimentary	377	

	370	tsunami	high energy sedimentary	378	
	372	transport of tsunamis	omit	380	
	374	tsunami	high energy sedimentary	382	
	375, 378, 379	tsunami	omit	382, 386,387	
	383	tsunami	high energy sedimentary	391	
	384	tsunami	high energy sedimentary	392	
	385	tsunami	omit	393	
	389	tsunami	omit	397	
	392	tsunami	high energy sedimentary	400	
	393	tsunami	omit	401	
	397	tsunami	omit	405	
	401	tsunami	high energy sedimentary	409	
	402	tsunami	high energy sedimentary	411	
	405	tsunami	high energy sedimentary	412	
	406	tsunami	omit	413	
	410	tsunami	omit	417	
	414	tsunami	high energy sedimentary	420	
	415	tsunami	high energy sedimentary	422	
	418	tsunami	high energy sedimentary	425	
	419	tsunami	omit	426	
	423	tsunami	omit	430	
	429	tsunami	high energy sedimentary	436	
	434	tsunami	high energy sedimentary	440	
	435	tsunami	high energy sedimentary	441	

	443	tsunami	high energy sedimentary	450	
	454	tsunami	omit	461	
	460	tsunami	high energy sedimentary	467	

27	394	ahigh	a high	402	
28	399	bad	poor	407	
29	401	that	and	409	
30	402	gives	gives a	409	
31	403-404				C: Interpretation R: omitted due to it was repeated in lines 584-586.
32	410-411			417-419	C: Rephrase? R: the sentence was rephrased in lines 417-419
34	416-417		Omit		C: move to section 6 or Discussion R: it was repeated in discussions, we removed it.
35	424	bad	poor	431	
36	432-433		omit	439	C: omitted these lines R: omitted
37	440			557-563	C: Interesting and quite usual for a tsunami deposit, but in contradiction with Font et al. (2010) R: We discuss this point in 557-563
38	445	and	Omit		
39	460-464			498-503	C: move to section 6 R: Moved
40	476		It might correspond to Santorini eruption tsunami.	577	C: It's interesting. Any idea about the source? R: it is may compared with Santorini ~1400 BC tsunami
41	479				C:This could be the first section of the discussion R: We leave this structure because relevant here and consistent with the aim of topic.
42	489	All these signatures with only three layers in the ~ 2 m thick sedimentary units indicate that this layer suggests tsunami deposits rather than storm.	The high energy sedimentary characteristics with four layers in the ~ 2 m thick sedimentary units indicate	479-481	C: I don't understand this sentence. R: We rewrote again as we meant here the frequency of four layers in 2 m thick sediment.

			that these layers are tsunami deposits rather than storm		
43	496		also	487	
44	498	Coarse brown and horizontal lamination	laminated coarse brown sand	489	
45	500	The pebbles also are	Pebbles are found	491	
46	506				C: What is loading structure? R: We have changed it with loadcast sedimentary figure.
47	505	Organic content greater than 5 mark	organic content greater than 5 % of dry weight	496	C: 5 what? unit? R: weight percent of dry sample
48	506	Folk 1968	omit		C : omit ?
49	509	Low energy marine	Low energy lagoon and marine	505	
50	521	X,y,z correlate	X,y,z might correlate	517	
51	538		Morton et al., 2007	544	C: references? R: We add Morton et al.,2007
52	540		This a probable large tsunami.	546	C: at two sites , It's indeed convincing and indicates a regional-scale event, so probably a really large tsunami. R: yes , we add this comment
53	545	Bimodal distribution			C: explanation of bimodal distribution ? R: We mean a mixture of fine and coarse grain size of sediments, the bimodal sediment distribution is common features of tsunami induced depositions depend on relations of fine to coarse particles and degree of erosion.

54	557-580		omit		C: avoid reputations ? R: removed
55	581		omit		C: idem, repeating. Try to organise better the discussion. R: removed
56	589-593				C: It's difficult to correlate the thickness of tusnami deposits with the proximity and/or magnitude of the seismic rupture. If you want to discuss this issue, it has to be develop and better justified. R: We agree with paragraphs comment. We removed these lines 589 to 593. To describe this well, We will need more cores and that will be in the frame of future perspectives.

Reply to **RC2** Review of Pedro Costa

Section 1: General comments:

Comment #1:
Restructure the manuscript. As it is results, discussion and conclusions are confusing. There are several paragraphs of results that need to be moved to discussion.
Reply
The authors agree with the reviewer suggestion of moving some paragraphs of results to discussion. Indeed, some sections of text needed to be transferred and the current structure of manuscript is now more consistent with the aim of the paper.

Comment #2:
The authors try to guide the reader. That is wrong. From an early part they assume the "event layers" are tsunami deposits. They should let the reader get to that conclusion and I think it is wrong to state the layers are associated with a tsunami event in the results. You should only do that in the Discussion.
Reply
The reviewer made a point here and we have removed the mention on the tsunami deposits and replaced it with high energy sedimentary layers all manuscript except in the discussion section (see all changes as in following table):

Previous line	Previous mention	New mention	New line
97	Paleotsuanmi	high energy sedimentary	109
235	tsunami	high energy sedimentary	255
261	tsunami	high energy sedimentary	278
298	tsunami	high energy sedimentary	306
307	tsunami	high energy sedimentary	316
320	tsunami	high energy sedimentary	324
320	tsunami	omit	325
327	tsunami	high energy sedimentary	332
329	tsunami	high energy sedimentary	334
333	tsunami	high energy sedimentary	338
333, 337	tsunami	omit	340,344
341	tsunami	high energy sedimentary	348
344	tsunami	high energy sedimentary	352
345	tsunami	omit	353
346	tsunami	omit	355

350	tsunami	high energy sedimentary	358
355	tsunami	high energy sedimentary	363
357	tsunami	high energy sedimentary	365
359	tsunami	high energy sedimentary	367
359	tsunami	omit	367
361	tsunami	omit	369
363	tsunami	omit	371
369	tsunami	high energy sedimentary	377
370	tsunami	high energy sedimentary	378
372	transport of tsunamis	omit	380
374	tsunami	high energy sedimentary	382
375, 378, 379	tsunami	omit	382, 386,387
383	tsunami	high energy sedimentary	391
384	tsunami	high energy sedimentary	392
385	tsunami	omit	393
389	tsunami	omit	397
392	tsunami	high energy sedimentary	400
393	tsunami	omit	401
397	tsunami	omit	405
401	tsunami	high energy sedimentary	409
402	tsunami	high energy sedimentary	411
405	tsunami	high energy sedimentary	412
406	tsunami	omit	413
410	tsunami	omit	417
414	tsunami	high energy sedimentary	420
415	tsunami	high energy sedimentary	422
418	tsunami	high energy sedimentary	425
419	tsunami	omit	426

423	tsunami	omit	430
429	tsunami	high energy sedimentary	436
434	tsunami	high energy sedimentary	440
435	tsunami	high energy sedimentary	441
443	tsunami	high energy sedimentary	450
454	tsunami	omit	461
460	tsunami	high energy sedimentary	467

Comment #3:

The authors are not convincing explaining the poor dating chronology established. I accept you could have dates in reverse order in the deposits (incorporation of older material). However, that should not happen in the immediately overlying and underlying layers. These should be in chronological order...and they are not.

Reply

The reviewer discusses the reworked sedimentation and reverse order of dating. However, one has to pay attention from the field work in trenches and cores that samples are not easy to find and to collect, especially before and after the presumable tsunami layer.

The constraint of past tsunami chronology is based on 5 samples in 1 meter stratigraphic section at Kefr Saber, and 8 samples in 2 meters of sediments at El Alamein site. Taking into account the difficulty and effort made in collecting valuable samples for dating, we disagree with the reviewer that our results is based on "*poor dating chronology*".

In presenting the 46 samples including reverse dating order, our work shows the difficulty of sampling and dating in such environment (with sometimes recrystallization and/or remineralization, contamination). Clearly, we are not in the ideal case-study of collected samples showing a straightforward chronological and stratigraphic order in such coastal environment.

In our case, we found it interesting that all obtained dating are presented together with the reworking difficulty that is openly discussed in lines 578-588. We also show how to separate the dated materials in groups and how with our processed data the dating analysis becomes consistent with the historical earthquake tsunami catalogue.

Comment #4:

A - *There is poor quantification of data in this manuscript*

Reply

In our manuscript we have analyzed 120 samples as following:

1- Grain size analysis (mean grain size and sorting)
2- Bulk mineralogy (XRD diffractions)
3- Total organic and inorganic matter, in addition of
    a- Detail descriptions (color , microfossil content)
    b- High-resolution of photograph of sedimentary sections
    c- X-ray scanning of cores
    d- Microfossils identification
4- Radiocarbon dating of 46 samples at two sites, and

5- Geochemical analysis in the Suppl. Material (Table S1 to S12 and Figs. S4-S15).

We do not think that this can be called "*poor quantification of data*".

B - *Figure 5, one cannot understand what was the resolution used. How many samples have you analyzed? On another topic you mention Pyrite on the Discussion has being widespread in the deposit when in fact it only appears in Core 7.*

Reply

We have added details in lines 113-116 to explain that our sampling rate was 15 cm in each core for geochemical analysis, and every 3 cm for the magnetic susceptibility.

As for the Pyrite and/or geothite, they are found with minor percent (less than in most of cores with relative high value at the base of event layer (557-563).

Comment #5:

The literature review is extremely poor and outdated. Introduction needs to be totally rewritten. There is a insignificant number of papers published after 2010. In particular, after the Tohoku-oki tsunami in 2011, a relevant number of papers were published moving forward this field of science. They should have been referred to.

Reply

Perhaps the reviewer did not find enough references of paleotsunami studies in the East Mediterranean, this is unfortunate but it is the reality. Although we disagree with the qualification of "*outdated literature*" (much of our references concern reports on past earthquakes and tsunamis in historical documents), and the aim of our manuscript is not meant to do a review on the 2004 Sumatra and 2011 Tohoku earthquake tsunamis. Nevertheless, we have added 16 new references (see underlined) and among them 8 are post-2010.

Although we find the request of a total rewrite of the introduction somehow excessive, we have included some changes. We have been submitting papers for publication in the past 30 years or so, and our introductions were generally considered as well written.

Comment #6:

The authors identify "event layers" based in a very limited number of lithostratigraphic evidences and none (or even all together) are sufficient to ascribe a layer as a tsunami deposit. They need to address this!

Reply

Our criteria to recognize signatures of tsunami event layers (see also section 4) are also those reported in Donato et al. (2008), Font et al. (2010), Chagué-Goff, et al. (2011), De Martini et al. (2012; with our direct observations of tsunami layers during field investigations of our colleagues in Sicily), Malik et al. (2015), Matsumoto et al. (2016) along with our post-earthquake tsunami deposit observations (mainly in coastal Honshu following the 2011 earthquake).

Beside the trenching and coring analysis of section 5, we summarize in section 6 (lines 478 to 521) our results based on detailed description of sedimentary successions that include units rich in organic matter with bioclasts, laminations, where X-rays, magnetic susceptibility, and determination of heavy minerals with radiocarbon dating of 46 samples are applied.

The identification of four high energy sedimentary layer with the discovery of the similar mixed white sand sheet layers with broken shells at two sites (Kefer Saber and El Alamein),

located ~200 km apart, and their dating with correlation of three of them with past tsunamigenic earthquakes is a striking evidence of tsunami deposits.

This is extensively addressed in sections 4, 5 and 6 of our manuscript and cannot be considered as limited evidences.

Comment #7

Furthermore, there are several paradoxes like relying on (volume) magnetic susceptibility to identify the layers as tsunami-related. For example, if you have coarser material it is likely you could have more lithic material and more magnetic minerals. However, you mention on lines 566 and 567 that your magnetic susceptibility peaks correspond with the higher values of organic matter and carbonates. This is something difficult to explain because organic matter and carbonates have very low magnetic susceptibility values.

Reply

We clarify this relevant issue in text-lines 557-563. The low magnetic susceptibility peaks reflect high content of organic matter and carbonates and these analytic results characterize the tsunami related deposits. However, in some cases minerals like pyrite or Fe oxides (goethite) in sediments are found in the bottom of tsunami layers (or intercalated) and they correspond to relatively higher peak of magnetic susceptibility (20-100 10^{-6}).

Comment #8

The manuscript needs proofreading. There are several mistakes and misspellings and the work will benefit from the input of a English native speaker. There are parts that are just to wordy and redundant.

Reply

The new version of manuscript is revised for the English syntax and grammar.

Comment #9

In the figures, and also elsewhere, you need to level the coring to m above mean sea level. You make correlations on Figure 7 assuming the samples are all at the same height above msl. That is wrong.

Reply

This is corrected and updated (see lines 982-983).

Comment #10

You need to provide the regional wave regime. How frequent are storms? Can they over-top the 2m high coastal dunes?

Reply

In the Mediterranean, the tropical to subtropical cyclones storms are frequent seasonal events, with ~100 recorded tropical like storms between 1947 and 2011. From tide stations recorded in front of Alexandria, the maximum wave height surge is 43 cm between 1971-2004 (Hamed et al., 1988), the maximum wave height surge is 76.9 cm between 1996-2000 (Hussein et al., 2010). See also supplementary material.

The comparison between storm and tsunami depends on the strong waves and their content of reworked deposits, fossils or organic matter and the sorting of grain size. Tsunami deposits tend to show much sorting and contain much bioclasts due to its powerful waves.

Section 2: Comments in the text with requested changes in manuscript and authors changes in text:

C1: Line 82-84 - How about Storegga? Landslides tsunamis can cause widespread effects.
R1: We have added explanations in lines 82-84

C2: Line 83 - "recent example" Tinti et al. (2005) has 13 years.
R2: Corrected

C3: Line 85-96 - extremely poor literature review. Why do you cite two papers from the Indian Ocean and the Pacific and only one from the Mediterranean?
R3:We add Tyuleneva et al., 2017 as a second example in the Mediterranean (lines 106-108).

C4: Line 97 and Line 105 - repetition of idea in the same paragraph
R4: We removed lines 118-119.

C5: Line 108-Tsunami catalogue of Egypt - is there a specific reference? where can we access it?
R5: Ambraseys et al. (2005) is the specific reference for Egypt (added in line 121)

C6:Line 115-119- Please rewrite.
R6: We have rewritten in lines 128 to 133.

C7:Line 124 - Please remove "in".
R7: Removed

C8: Line 125 - Please write "Rhodes"
R8: Rhodes is rewritten (line 138).

C9:Line 126-128 - Please rewrite
R9: The sentence is rewritten in lines 147-150.

C10:Line 130-132 - Repetition of 1st sentence of the paragraph
R10: The repeated sentence is removed

C11:Line 136-150 - Please rewrite, simplifying the text.
R11:151 to 160 updated with simplified text

C12: Line 169 Please replace "designated" by "likely sites to preserve past tsunami deposits".
R12: Done in line 179

C13:Line 178-179 - is a challenge everywhere.
R13: Yes sure, but here the problem is in the Eastern Mediterranean region

C14:Line 180 - Please add a more recent reference
R14: We add Morton et al., 2007 (updated lines 191)

C15:Line 185 - Please correct reference.
R15: Corrected at line 196

C16: Line 185-200 - needs to be rewritten and to be reorganized to clearly state which are the common tsunami deposit features. There are many missing. Please check papers by Chagué et al. (2011; 2012), etc.
R16: The paragraph is rewritten to point out common features of tsunami deposits. We also add Chagué et al. (2011) in line 208.

C17: Line 212 - Please change here and elsewhere in the results chapter reference to "tsunami deposits". Change it to "event layer".
R17: Except in discussion and conclusions, the "tsunami" term is changed in "high energy sedimentary layer" (see also table in above reply to comment #2).

C18: Line 225 - You should cite Folk and Ward (1957) for grain-size distributions (line 225).
R18 & R19: Done in updated line 238

C20: Line 238 -Please change the name of this section to results.
R20: In order to be more specific, we prefer the title **Description of sedimentary layers in trenches and cores with C14 dating results**, updated in lines 258.

C21: Line 254-257 -Please pass it to the discussion.
R21: The change is in discussion section (lines 553- 555)

C22: Line 261 - Change it to "event layer".
R22: We used instead high energy sedimentary layer in line 278

C23: Line 273 – here the deposit is 30-73 cm in all trenches P1 to P4 but on line 250 is just from 30-50 cm!
R23: This is corrected in line 290 with 25-55 cm depth

C24:Page 11-page 19 - all this results section deserves the following comments:
a) In P2 you assume to have >5000 years sedimentation in 27 cm. How come the top 70cm is just app. 2000 years? What changed? How do you explain this difference? How about sea-level changes, how do they constrained sedimentation rates in these lagoons?
We answer the question in lines 578-588. The lagoon sedimentary environment is often made of mixed and reworked marine and continental deposits. The interpretation of these deposits as a chronological order is problematic.
Sea level change is negligible in the late Holocene time [see also Fleming, K. *et al.* Refining the eustatic sea-level curve since the Last Glacial Maximum using far-and intermediate-field sites. *Earth Planet. Sci. Lett.* **163,** 327-342 (1998)].

b) I acknowledge and appreciate that you assume the shortcoming of the dating obtained but how come not a single date in several cores are in stratigraphical order? Again, if it was just the event layers...you just get samples in the right order in the under and overlying layers. You need to offer a convincing explanation for this fact. Just saying that this was due to reworking by the "tsunami" is not enough.
We provide explanations in lines 578 to 588 for the overlapping dates and also in our reply above for comment #3.

c) How come (on line 275) you state "related chronology are comparable in all trenches" when you assume dates have such a wide range? You need to support this sentence with clear data correlation.

Regardless of the reworked deposits, we consider the stratigraphic succession of neighboring trenches (P1 to P4) at Kefr Saber, and their relative sedimentary chronology of units deposited in the same lagoon as comparable. In order to overlook the old ages due to reworked deposits, we select radiocarbon dates younger than 2000 year BP and obtain a consistent chronological succession. (see changes in lines 292-294).

d) Dendropoma shell and its dating. What species was dated. There are some Dendropoma species that live beyond 50 m below msl. If these boulders were transported inland and the shells are well-preserved they had to had been transported in suspension (if they were dragged or rolled the shells would break). You state they were dragged on line 286. Can you try to explain this more consistently?
The common species type found in boulders is Dendropoma Petraeum and Vermetus Triquetrus.
The boulder surfaces are fully submerged in the sea with Dendropoma species and then transported by tsunami waves or storms waves. Some Dendropoma and Vermetus are stuck on the boulder and hence well preserved.

C25: Line 269-270 should be moved to Discussion
R25: Moved in discussion section (lines 579 to 581)

C26: Line 281-288 should be moved to Discussion
R26: Moved to lines 519 to 528 (section 6)

C 27: Line 300 the layer had brown clay sediments or consisted of brow clay sediments? The poor sorting was measured how (visually or after grain-size analysis)? What were the main components of these populations (Shells, quartz and clay material)?

R27: It consists of brown clay sediments (see line 300 – 301).
These methodological details are added in the supplementary material (methodology section).

The main values of each layer are given in the core figures according to the detailed description of layers and the bulk minerology (including weight percent of minerals, Tables S1 to S12 and Figs. S4 to S15 in the supplementary material).

C28: Line 303 - please replace "extremely bad sorting" by "very poor sorting".
R28: Done in line 311

C29: Line 305 – please replace "bad" sorting by "poor sorting".
R29: Done in line 313

C30: Line 307 - "some turbiditic structures". Which ones? Be clear and specific about which sedimentary structures you are describing
R30: We mean by turbiditic structures like rip clasts, cross bedding and laminations (line 307). X-ray scanning show vertically and horizontally oriented gastropods seen in cores before opening and cut in two longitudinal half. These structures are used to identify the tsunami deposits
The mention to the turbiditic features is added in the supplementary material (Fig S3).

C31: Line 310-318 should moved to Discussions
R31: We have omitted these lines because they are repeated in section 6

C32: Line 328- articulated shell?
R32: No, the two samples dated in core 2 are gastropods and not articulated shell.

C33: Line 337 -"Organic matter >2" in which unit is this expressed? % of dry weight? % of total sediment fraction?
R33: In Core 4, the white sand at ~12.5 cm depth, where the organic matter > 2 % of dry weight of total sediment fraction, at line 354.

C34: Line 349-352 - Discussion and again repeating the same explanation
R34: We here necessarily describe once again why we have the shell age 32887-34447 BC. We consider that our explanation on the strong wave action during catastrophic events may stay in this section.

C35: Line 356 - well, could be the limit of tsunami coarse deposition. Not the inundation limit. Only with geochemistry you will be able to establish more accurately the likely limit of inundation.
R35: Yes, we agree.

C36: Line 383 - the date range obtained is almost 1000 years! You need to constrain the ages much better and more accurately.
R36: The dated sample is made of shell, and the large age range is from the laboratory dating on which we proceed with correction of the reservoir effects (line 390-391).

C37: Line 384-391 and elsewhere why are these layers considered to be tsunami related?
R37: As previously explained (see table of comment #3), we have changed "tsunami deposits" by "high energy sedimentary layers" until section 6 of the manuscript.

C38: You mention on lines 460- 462 that these "tsunami" layers have been identified based in "photography and x-rays, magnetic susceptibility, organic/mineral content and by the existence of mixed coarse and fine sand with broken marine shells". This is poor and insufficient. You need to provide more data and go through a vast list of sedimentological criteria before you rush to conclusions. See papers by Chagué et al., 2011 and 2012, Costa et al., 2012 and 2016, etc. for comparison
R38: We do not rush to conclusions. The manuscript has long sections of layer descriptions with sample analysis, and we provide results that lead to the identification of tsunami deposits.
We appreciate the suggested and helpful publications of Chagué et al. (2011) and Costa et al. (2014); (see lines 204 to 208, and lines 88 to 91).

C39: Line 466-477 - Please move it to Discussion.
R39: We have moved these paragraphs to Discussion section (lines 564-577).

C40: Line 489- 490 - Another crucial topic. Why you say they are more likely to be a tsunami than a storm? Have you detected any storm layers? But you state they are more frequent and they are likely to over-top the dune field.
R40: Please see our reply of comment #10 here above and lines 541 to 556 in discussion section.

C41: Line 495 - You only mentioned Pyrite on core 7 and now.... Heavy minerals? Which ones? Did you counted them? Please provide quantitative data.
R41: We add the bulk mineralogy semi quantitative data in supplementary material (Tables S1 to S12 and Figs. S4 to S15).

C42: Line 500 - pebbles and loading structure- please clarify text.

R42: The loading structure is a typical sedimentary marker of deposits. It also means that the heavy pebbles and coarse sediments transported by the tsunami wave in the lagoon end at the base of the sedimentary succession.

C43: Line 506- You wrongly cite Folk (1968) and state he mention ">5" mark for organic matter in tsunami deposits?!?
R43: Yes indeed, we removed Folk 1968 (update line 496-497)

C44: Line 508-522 - this paragraph belongs in the discussion.
R44: This section is part of summary of results and we prefer not to move it.

C45: Line 525-527 - Please rewrite this sentence.
R45: Changed in 531 to 532.

C46: Line 534-536 - sentence not supported by the data presented.
R46: The reviewer apparently does not accept our results and interpretation.

C47: Line 538-540 - Do storm layers exist? If no, why? If yes, please compare them with your "event layers".
R47: The discrimination between storm and tsunami deposits is largely treated in the manuscript and in discussion (see lines 188-208, 541-556). We explain in our manuscript that frequency and signature of tsunami deposits significantly contrast from those of storm events that leave a faint sedimentary signature.

C48: Line 545-547 - a bimodal curve only represents two likely sediment sources. Please update references and clarify idea
R48: Bimodal means the existence of fine and coarse grain size of sediments. The bimodal sediment distribution is a common feature of tsunami deposits that also depend on the proportion of fine and coarse particles, and degree of erosion during the wave propagation. (new reference: Scheffers and Kelletat, 2003 in line 551)

C49: Line 549 - "consistent depth". Well, below surface yes but you need to provide height above mean sea level to make this correlation credible.
R49: Done in updated lines 982 to 983.

C50: Line 557 - You have a lack of radiocarbon dates between the Younger Dryas and Holocene sea-level stabilization. Is there a scientific justification for this fact? Or a methodological one?
R50: Our observation on the radiocarbon hiatus [i.e., in between 13430 year BP and 5065 year BP] may simply be due to erosion processes (taking into account the sea level and exposed continental domain during the late Pleistocene and early Holocene). However, we have no documented work with precise data on this issue.

C51: Line 559-561 - Strongly disagree. You have not proven this point.
R51: All evidences (proofs) are presented in the manuscript and we do not share the reviewer opinion. Our interpretation supported by the presented data and results in manuscript suggests that the three high energy sedimentary layers made of mixed white sand and coarse layers with broken fossils (also observed 200 km apart for one of them) are the trace of tsunamis events in AD 365, 1303 and 1870.

C52: Line 565 - "chemical characteristics". You could also provide geochemical data. Which elements have you measured?
R52: We did bulk mineralogy using XRD and identified the minerals according to the fingerprint **(Å)** of minerals with semi quantities analysis. We provide the bulk mineralogy analysis in supplementary material (Tables S1 to S12 and Figs. S4 to S15).

Reply to **RC3**, Review of Cristino Jose Dabrio Gonzalez

Section 1 main comments

Comment #1:
Line 81,Yalciner et al. (2014) estimated that up to 500 km^3 landslide volume, with wave height ranging from 0.4 to 4 m, might have taken place offshore the Nile Delta.
When?
Reply
These results are based on modelling outputs of Yalciner et al. (2014), but there is not enough measurements to emphasize the tsunami landslide offshore the Nile Delta until now. Line 80-82.

Comment #2:
Lines 87 to 96, is this relevant for the Mediterranean examples?
Reply
It appeared to us important to show some significant worldwide paleotsunami studies. As for the Mediterranean, beside the study in Sicily (de Martini et al., 2012), we add examples of paleotsunami studies in Crete (Minoura et al., 2000), Turkey (Papadopoulos et al., 2012) and in Israel (Tyuleneva et al., 2017), in lines 102 - 108.

Comment #3:
I could not locate it in the massive figure (earthquakes 1303)? ➔ comment in line 132
Hardly visible figure 1➔ comment in line 160
The areas symbol not visible
Reply
Figure 1 is updated with star symbol to clarify the location of historical earthquakes

Comment #4
Line 138**,** what do you mean with felt shaking?
Reply
Felt earthquake shaking

Comment #5
Line 164, the dunes are weathered where the rocky headlands outcrop
What is meaning?
Reply
Changed in "When the sand dunes are removed they leave rocky headland outcrops" in line 175.

Comment #6:
Line 211 the outlet of sea water not well indicated in figure 2
Reply
Figure 2 is updated with an arrow to the outlet of sea water.

Comment #7:
Line 227 to 235
If samples sent to 3 labs it is most likely that results are difficult to compare explain this.
Did you try test sample to the three labs to check the accuracy of measurements?
Reply
A single sample only was sent to two laboratories (Poznan laboratory - Poland, CIRAM in France) in order to test the accuracy of dating and we received similar results.

Comment #8:
Line 235, I think that this methodological approach deserves some more exploration or do you simply push some keys to get date?
Reply
The Bayesian method (conditional probability) included in the Oxcal program of Bronk Ramsey (2009) provides simulated ages that require an analysis of sedimentary sequence and preliminary stratigraphic chronology aided with a careful collection of datable samples. It is certainly not a "push-button" procedure.

Comment #9:
Line 240, About Salama 2017 this is not a document that you can easily consult
Reply
The Salama (2017) PhD thesis dissertation is in the public domain and can be easily obtained at the University of Strasbourg Library.

Comment #10:
Line 252, Contains broken shells of marine origin any idea of taxonomy
Reply
We characterize the size or quantity of broken shells that contribute to the identification of the high energy sedimentary layers, rather than to identify the shells themselves. We did not do the systematic taxonomy of broken shells.

Comment #11:
Line 254-257, In the abstract, the authors agree that they interpret the coarse layers as tsunamigenic after studying a variety of features and analytical results… and here they just jump to this interpretation of landward decrease of grain size. I don't completely catch the idea. Please check !
Reply
We here describe the landward decrease of grain size of the white sandy layer from Kefr Saber trenches. This interpretative section is moved to discussion. Lines 553-555.

Comment #12:
Line 273, Located ~ 30 - 73 cm depth in all trenches P1 to P4 suggests clarify ?
-30 and -73 or between -30 and -73 (43 cm in thickness)
Reply
Changed in "located between 25 and 55 cm depth in all trenches". Line 271.

Comment #13:
a- Lines 281 to 285, the location of the boulder and its relation with cores provided or I missed it.
Reply
We did not do a correlation between boulders and cores. We only took samples from the boulders in the first site at Kefr Saber. We found no boulders at the second site (El Alamein).

Comment #13:

b- Did Goff et al.,2012 find boulders with Dendropoma?
Reply
This is a mistake. We removed Goff et al., 2012, and moved the section to discussion. Now in line 519 – 528.

Comment #13:
c- Are the storms able to displace and regulate large boulders even in platforms several meters above sea level?
Reply
We did not do yet a detailed work on boulders in the northern coast of Egypt, but other studies such as Nott in 2003 (Waves, coastal boulder deposits and the importance of the pre-transport setting. Earth Planet. Sci. Lett. 210, 269–276) and Maouche et al. (2009; with common coauthors) compare the effects on boulders from storms and tsunamis using wave height and boulders characteristics (size, weight, density).

Comment #13:
d- … again the location and stratigraphic position of the boulders are unknown
Reply
The large boulders are found at many sites along the northern coast of the Egypt, and we noticed them during our field investigations in Ras El Hekma, Ras El Alam, Rum, Mersa Matrouh, and Kefr Saber. We have taken only one sample from boulders at Kefr Saber site. We add the geographic location of boulder in line 521

Comment #14:
Line 303, if these are fragments, it means that they are broken shells/bioclasts highly broken ?? please explain what is mean ?
Reply
We describe the size of bioclasts and highly broken means rich with fragments.

Comment #15:
Line 307, X-ray scanning shows some turbiditic structures…. Turbiditic structures in the lagoon….identified by X-ray ?
Reply
Turbiditic current structures may result from strong waves. Turbulently suspended sediments form density current that can be observed in X-ray scanning such as inclined stratification with cross-bedding and ripup clasts observed in cores 8 and 12, respectively. Line 316. (Fig.S4 in Suppl. material)

Comment #16:
Line 332, and the outlet of sea water has revealed three tsunami layers please clarify ?
Reply
The sea water inundated the coast in lowland between high dunes, which allowed tsunami waves to deposit the three layers. Lines 338 – 340.

Comment #17:
Line 376, Is gypsum detritus or cement?
Reply
The gypsum is cement.

Comment #18:
Line 339 to 348 the description needs a little rewriting of English.
Reply

Corrected for English syntax and grammar.

Comment #19:
Line 500, What do you mean by loading structure?
Reply
Changed in loadcast sedimentary structure. Line 491.

Comment #20:
Lines 517 to 522, are w,x,y and z convential names or simply reformal terms used by you during ……? I could not read the last word
Reply
Yes, the w, x, y and z are simple labels of chronological events.

Comment #21:
Line 525-535: I don't see the need of this simulation. You have brackets of ages and correlate with the described phenomena.
Reply
The Bayesian simulation provides an age range with probability density function (95.4%), which is more appropriate than a simple bracket of dates.

Comment #22:
Line 532: Which is the origin of that debate? I preformed that you refer to the location of the epicenter. Please explain !.
Reply
The debate is on the earthquake location, size and its tsunamigenic capability. See also lines 157 to 160 and related references.

Comment #23:
Line 533, The tsunami happened ! there is no possible debate about this fact ?
Reply
Yes, indeed it occurred, but the debate in only on the tsunamigenic earthquake location.

Comment #24:
Line 537-550, If you are talking about your recently penetrated cores why do you mix with other people and localities that have nothing to do with the Eastern Mediterranean?
(These are not your cores!!!)
Reply
Well noted. We remove text and references to Shi et al., 1995; Gelfenbaum and Jaffee 2003 and Goff et al., 2001, 2004. Lines 541 - 556.

Comment #25:
Line 547, Why you simulate ages when you have dating.
Reply
See reply to comment #21

Comment #26:
Line 567, What is the type of organic matter?
Reply
We refer to organic carbon.

Comment #27:
Line 575 to 577, the succession of sudden high-energy deposits with low energy and slow sedimentation may include reworked units with a disturbance in their chronological succession. Explain?
Reply
Reworked units include disorder in the chronological stratigraphic succession. Line 614.

Comment #28:
Line 580**,** Including charcoal and perhaps rodent bones? Obviously worst ages of high energy events are those from shells (marine). What is your reply?
Reply
We meant that the large uncertainties in dates result from 1) mixed deposits (reworking) and 2) different type of samples (charcoal, bones and shells) analysed.

Comment #29:
Line 811, I cannot distinguish the size of scale for figure 3
Reply
Figure 3 is updated.

Comment #30:
Line 823, These are hands with pointing fingers!
Reply
The figure and legend are updated to leave arrows.

Comment #31:
Line 832, Pdfs what is mean ?
Reply
Probability density functions

Comment #32:
Lines 910-911, the aim of these figures is to show sites of trenches/drills please use bigger characters to make them visible (Location, Orientation)
Reply
Figure 2 is updated.

Comment #33:
Lines 917-919 (Figure 4), I'd suggest using BP age, as the traditional AD/BC is somewhat confusing. Then, the authors may return to AD/BC nomenclature to fit the more claimed pictures and view and add the middle line
Reply
The reason why we use AD/BC is because it can be easily compared with historical events in catalogues.

Comment #34:
Lines 922 to 923, the numbers are invisible.
Reply
Figure 5a is updated.

Comment #35:
Lines 926. Hard to read (not visible)

Reply
Figure 5b is updated.

Comment #36:
Lines 932-934 (figure 7) (elevation above sea level and directions)
Reply
Figure 7 is updated.

Section 2: Comments of RC3 in the text and authors changes in text:

No.	Lines edited	Previous manuscript	Revised manuscript	New lines	COMMENT
1	49	marine	coastal lagoon	48	
2	50	Shell	shells	52	
3	129	apart carried up	apart and (or?) carried up	142	
4	163	Fig.2 and Fig.3	Fig.2	175	Omit fig.3
5	165	ridge	ridges	176	
6	169	designated	Likely	179	
7	187	bivalve and shells	bivalve shells	203	Bivalve also have a shell
8	187	the large number of mixed broken bivalve shells that occupy large vertical and lateral stratigraphic positions	the large number of mixed broken bivalve shells that and gastropods occupy vertical and horizontal stratigraphic positions due to high wave current	202-204	C:clarify? R: done 193-194
9	191	than	compared with	205	
10	223	X-ray diffraction using Philips PW 1730	X-ray diffraction using a Philips PW 1730 measurement	240	
11	226		magnetic susceptibility was measured for cores every 3 cm -120 samples were collected from cores for each 15 cm	233-240	C:Spacing of magnetic susce. And geochemical analysis R: done
12	238	description of	description of	258	C: description of

		trenches and cores sedimentary layers	sedimentary layers in trenches and cores with results of C14 dating		exposed trenches and cores penetrated in sedimentary layers R: We used suggestion from reviewer to add C14 dating to the title.
13	246	P1, P2, P3 and P4 are 20 to 40 distance	P1, P2, P3 and P4 are 40 to 154 meters distance from shoreline	266	C: Distance to what? Request spacing between trenches? distance to dunes ridges R: I correct this lines
14	250	30-50 cm depth	25-55 cm below surface	271	I corrected the real depth
15	256	broke	broken		R: we omitted this sentence
16	259	display modern age	yield modern age	276	C: The age is not displayed R: the sample are given modern from the laboratory result
17	261	100 cm depth	below surface	278	
18	263	collected charcoal samples	charcoal samples collected	280	
19	264	located	recovered	281	
20	264	depth	below surface	282	
21	268	between	of	580	
22	269	denotes of the deposit of reworked layers with in environment of young sedimentation in lagoon	points to reworked of former deposits and redeposit on a lagoon.	581	
23	281	Shells Dendropma	Dendropoma (worm snails)	519-522	C:Does Dendorompa have a shell or is it a tube? R: Dendropma is a genus of irregularly coiled seasnails known as "worm shells" or "worm snails'' we have two common species Dendropoma petraeum & Vermetus triquetrus
24	289	except	except,	297	
25	292	30 cm depth	at ~ 30 cm below surface	301	
26	297	The core depth	The core a	305	

		reached ~2.14 m	depth of ~2.14 m		
27	298	From here the authors alternatively refer to coarse grained or to tsunami layers	I changed here to high energy sedimentary layers	306	
28	300	The first layer is ~12.5 cm depth with 34.5 thick , brown clay sediments with poor sorting fine grain sediments	The first layer is at ~12.5 cm depth, ~34.5 thick. It consists of poorly sorted brown clay, fine grained sediments	308,309	
29	303	~75 m	~75 cm	312	
30	308	Shell	Shells	317	
31	311	40 cm depth	40 cm below surface	320	
32	312	Shells fragments	Shell fragments	321	
33	313	The peak of magnetic susceptibility	Low peak of magnetic susceptibility	322	
34	319	as shown in core 2 is	as shown in Fig.S2-2	323	
35	321	two tsunami layers	two penetrated tsunami layers	324	
36	321	is 12 cm thick brown clay sediment	is a 12 cm thick brown clay	325	
37	325	with peak	with low peak	329	**Large / small peak?**
38	326	components of halite	amounts of halite	330	
39	334	corresponding to 26 cm	corresponding to a 26 cm	340	
40	336	with a peak of magnetic susceptibility near zero value	with a low peak value	343	C: a peak at zero value? R:changed to low peak
41	337	depth	below surface	344	
42	339	45 depth and show	45 cm depth and have	346	
43	354	The core reach 73 cm depth	The core reach a depth of 73 cm	362	
44	365	broken shells fragments	bioclasts	373	
45	366	gastropod	gastropod shell	374	
46	380	bad	poor	388	

47	381	aminor	a minor	388	
48	383	provides 293-1113 BC	provides age 293-1113 BC	391	
49	385	The first tsaunmi layer is 16 cm thick pale silty clay	The first tsunami layer is a 16 cm thick pale yellow silty clay	393	
50	386	highly broken shell fragments	bioclasts rich	394	Perhaphs you use highly small pieces of shells clarify? i.e rich
51	390	highly broken shells fragments and badly sorted angular gravel sediments	shell fragments and poorly sorted angular gravel-sized clasts	398	
52	394	ahigh content of organic matter and ripsup clasts	a high content of organic matter and ripup clasts	402	
53	399	Bad granulometeric sorting	Poor sorting	407	
54	404	high current wave	high current energy wave		C: current / waves? R:we omitted this sentence
55	415	70 cm depth showing	70 cm below surface with an estimated age of	423	
56	445	It is characterized by and poor sorting, high magnetic susceptibility	It is characterized poor sorting, low magnetic susceptibility	452	How high the organic matter and gypsum? I changed this miswriting low instead high
57	454	high energy tsunami waves	high energy waves	461	
58	452	The fourth sample is off sequence with respect the other samples			C: Beyond the readi of the C14 method!!. R: It is comparison with trend of the other samples, it is 39560 - 40811 BC. The C14 is 50000 years.
59	459	located ~ 10 cm to 170	located from ~ 10 cm to 170 cm	466	
60	460	identified three	Identified four	467	3 or 4?

		or four tsunami layers	high energy sedimentary layers		
61	462	broken marine shells	bioclasts	471	
62	468	as due to sedimentary units that include reworked material	as a result of reworking of older rocks.	556-567	This part are moved to discussion.
63	480	show	expose	470	
64	481	sand mixed with broken shells fragments that	sand with bioclasts. We assume that	471	
65	486	are well visible coarse	are well visible as coarse	477	
66	488	become fine landward	become finer grained and thinner	478	C: Finer grained or thinner ? R: both
67	489-490	sedimentary units indicate that this layer suggests tsunami deposits rather than storm	sedimentary units suggest that these layers are tsunami deposits rather than storm.	481	
68	495	The presence of goethite and pyrite	Goethite and pyrite	486-487	
69	496	was	were	487	
70	500	The pebbles	pebbles	491	
71	501	Goethite and pyrite	goethite and pyrite	492	
72	504	shells fragments	Shell fragments	495	
73	506	Folk 1968	omitted	497	C:Do Folk refer to tsunamis? R: No, only refer the equations of grain size and sorting . so, I omitted the reference from here
74	512	The bracket	to bracket	508	
75	514	due to the reworked sedimentation with	due to highly reworked sedimentation and significant mix of old	510-511	
76	517	result in sequence of ages allow the bracket of an	results in a sequence of ages that allows to bracket of an	513-514	

		event	event		
77	525	The identification of tsunami deposits	The identification of assumed tsunami deposits	531-532	
78	551	reworked			C: reworked marine but reworked to a certain extent ? R: It is difficult to obtain the different process result in …
79	553	reworked deposits intercalated with new units			C: insitu or autochthonous R: autochthonous
80	555	distinguish between old and new isotopic			C: with respect to what? R: respect to age of dated samples
81	559	indicate	indicates	595	
82	560	tsunamis	tsunami	596	
83	561	The first are large earthquakes with	The first two events correlate with	597	
84	562	The evidence the 365 tsunami	The existence of the 365 tsunami	599	
85	564	Stanely et al., 2006	Stanley and Bernasconi 2006	600	
86	564	main	recognized	601	
87	567	value	content	604	
88		Organic matter	organic carbon matter	604	
89	568	There record of past tsunami deposits is	The record of past tsunami deposits along Egyptian Mediterranean coastline	605	
90	574	are	is	611	
91	575	Correspondence with AD 365 earthquake	the correspondence one of them with the AD 365 earthquake	612	
92	579	with the			Could not read the comment
93	584	nearby radiocarbon			C: of nearby radiocarbon dating

		dating			R: it means respect to the arranged new radiocarbon dates samples
94	587	have a large thickness	is thicker	619	
95	809	where?	I add here at El ELAlamein site	876	
96	811	dimensions	panorama	878	
97	812	flag	flags	879	C:there are two of them

Notes:
In annotated manuscript,

- Page 14, 3 comments in lines 349 to 359 are hard to read (not visible)
- Line 579 comments cannot be read.