Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2018-62-AC1, 2018

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Paleotsunami deposits along the coast of Egypt correlate with historical earthquake records of eastern Mediterranean" *by* Asem Salama et al.

Asem Salama et al.

m.meghraoui@unistra.fr

Received and published: 12 June 2018

Please find attached the reply to RC1 (R. Paris) 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 the referee 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 here below:

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 reviewers 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.âĂŁ391 – 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 $\sim$2 x 1 The trench size is typically $\sim$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 and cores sedimentary layers Description of exposed trenches and cores penetrated with C14 dating of sedimentary layers 258 C: It's not only 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 $\sim$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 $\sim$ 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 $\sim$ 2 m thick sedimentary units indicate that these layers are tsunami deposits rather than storm 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. 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.

Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2018-62/nhess-2018-62-AC1-supplement.pdf

---

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2018-62, 2018.