Reviewer #2 (Formal Review (shown to authors)):

Tectonics Paper # 2017TC004920 :

"Late Holocene structural style and seismicity of highly transpressional faults in southern Haiti"

by Jiannan Wang, Paul Mann, and Robert Stewart

Review by J-F Ritz

General comments:

The objective of this article is to summarize the geological, geophysical, GPS, radar interferometry, seismic replication and modeling data collected since the 2010 Haiti earthquake to better understand and model the transpressive area, parallel to the trace of the EPGFZ. The article appears as a review article about the question of the structural style within the EPGFZ (question of the geometry and the kinematics of Holocene/active faulting).

I found the article very interesting to read although it is written in an "unsual" style, with for instance the objectives of the study in a separate section, and not at the end of the Introduction, or with long sentences containing several interlockings ("emboitements" in French). For instances phrases at lines (73-78), (100-106), (197-203), (547-551)... Being a not native English-speaker, I find this style of writing not always easy to follow. I think that shorter sentences would help to better follow what authors are telling.

I found the observations well described and their interpretations pertinent in general (see detailed comments), which give at the end - at least for reader who is not familiar with the studied area (which is my case), a very good synthesis of its recent and active tectonics.

However, it is a long article, which I did not read at once, and I get the feeling that there were a few repetitions in the manuscript. Also, described objects (folds, faults, kinematics, localities, profiles) mentioned/described in the text are not always easy/straightforward to find in Figures. I suppose this is partly due to the fact that figures are small and containing many things (except figure 2A where, in contrary, few things could be pointed out (see below)). Figures contains many mistakes (as the authors did not downloaded the last version of their figures..).

Detailed comments:

Abstract:

Line 18: ".., although, .." ?

**We break this long sentence into two and replace “although” with “However”. The changes are highlighted with underline.**

Manuscript:

Line 39: ...include:

**We add … “have been done,” in front of “including”. The change is highlighted with underline.**

Line 68: ...quiescent and..

**We correct this error accordingly and highlight it with underline.**

Line 70: Please show the CMT in Figure 1

**The CMT has been added to Figure 1B. The figure caption has also be updated and highlighted with underline accordingly.**

Line 75: .. of the northeast-southwest compression..

**We correct this error and highlight it with underline.**

Line 78: delete "show"

**We delete “show” and highlight the change with underline.**

Line 84: .., north-dipping, Léogâne fault..

**We correct this error and highlight it with underline.**

Line 85: southwest-dipping Trois Baies fault..

**We correct this error and highlight it with underline.**

Line 87: delete "motion"

**We correct this error and highlight it with strike-out line.**

Line 93: ..30{degree sign}-45{degree sign}. These structures strike..

**We rewrite this sentence as recommended and highlight it with underline.**

Line 130: ..include

**We correct the typo and highlight the corrected word with underline.**

Line 136: ...to the west (Figure 1B).

**We correct the error and highlight it with underline.**

Line 143: ...Miocene to Recent

**We change “recent” to “Recent” and highlight it with underline.**

Line 160: delete "(Figure 2A, B)"

**We delete "(Figure 2A, B)" and highlight the new sentence with underline.**

Line 162: Which grids ??

**By saying grid, we meant our survey lines (they are layout as grids). They are not plotted on the figure because the figure is getting too busy. To avoid the future misunderstanding, we change the “grids” into “survey lines” and highlight it with underline.**

Line 163: delete "(Figure 1B)"; We don't see the profiles in Fig. 1B

**We delete "(Figure 1B)" and highlight the change with strike-out line.**

Line 182: .. the Gonâve microplate..

**We change the “plate” into “microplate” and highlight it with underline.**

Line 185: "Septentrional ss fault" ? Where in Fig. 1 ?

**It is the plate boundary between North Hispaniola microplate and Hispaniola microplate along the north side of the Hispaniola island. We add all the major fault-zone labels in Figure 1A. Also, we explain it more in the text and highlight it with underline.**

Line 192: idem

**We add a label of Septentrional fault zone to Figure 1A and some more detail in Line 185. The changes in the text have been highlighted.**

Line 221; "Chaîne des Matheux" ? Where in Fig. 1 ?

**We add the label of Chaîne des Matheux into Figure 1B and Figure 2A. We also update the text and highlight it with underline.**

Lines 222-223: "as we are proposing in this paper...(Figure 2A,B)." It is a kind of discussion > should not be in the Tectonic Setting section.

**We delete this phrase and highlight it with strike-out line.**

Lines 234-235: "rather than being... on Figure 2A, B)" . Idem (this should not be in the Tectonic Setting section).

**We delete this phrase and highlight it with strike-out line.**

Line 248: delete "the" in ".., derived by the Mercier de Lépinay..".

**We delete this “the” and highlight it with strike-out line.**

Line 270: "Massif de Selle" ? Where in Figure 2 ?

**We add a label of Massif de Selle and updated the text with highlight as underline.**

Lines 290-295: 2) the fold axes along the southern margin of the Cul-de-Sac basin are asymptotic, or gently curve into east-west parallelism with the main trace of the EPGFZ along the southern edge of the Cul-de-Sac basin, as typical broad zones of shearing on thick, sedimentary rocks (see the inset of Figure 2B; modified from Odonne and Vialon [1983]).

**We rewrite this part accordingly and highlight it with underline.**

Line 305: "the Canadian Superior 2D" ? What does it mean ? What is it ?

**It is the name of the seismic data set. The data was acquired by a Canadian company and name as it. We write the sentence to avoid confusion. The new sentence is highlighted with underline.**

Line 309: delete "north"

**We strike out the “northern” and highlight it with strike-out line.**

Line 317: ...related to the activation of two conjugate thrust faults..(add "the", delete ",")

**We correct this sentence and highlight it with underline. Right now, it is in Line 320 – 321.**

Line 321: Aftershocks indicate that the ..

**We correct this sentence and highlight it with underline. Right now, it is in Line 324.**

Line 332: delete "to the south"

**We delete “to the south” and highlight it with strike-out line. Now it is in Line 335.**

Line 334: basal (rather than "basinal", no ?)

**We think it should be “basinal” since the Léogâne plain is a “basin-ish” area.**

Line 337: delete greater

**We delete the “great” and highlight the change with strike-out line.**

Line 339: add "area" after urban

**We add “area” to the text and highlight it with underline.**

Line 354: add "probably" after ..phenomenon would

**We add “probably” into the sentence and highlight it with underline.**

Line 357: replace "this" by "Lake Azuey area"

**We change this part accordingly and highlight it with underline.**

Line 361: "All three.." ? Recall the names

**We list the names of these three thrust faults and highlight them with underline.**

Line 370: delete "in the highlands south of the EPGFZ."

**We delete it and highlight the change with strike-out line.**

Line 378: "... have established the late Holocene to include .." uncorrect style

**We rewrite the whole sentence and highlight it with underline. The new sentence is between Line 380 -- Line 383.**

Line 399:...the EPGFZ correspond to the historical events of October or November 1751."

**We correct the sentence accordingly and highlight it with underline. Now it is in Line 403.**

Lines 399-400: delete ", and the deformed sediments in Lake Azuey are Holocene age" or put it before the last sentence of the paragraph.

**Same as last one. We correct the sentence accordingly and highlight it with underline. Now it is in Line 404.**

Line 403: delete "(Figure2A)".

**We delete "(Figure2A)" and highlight the change with strike-out line.**

Lines 409-410: Where in Figure 2A ? not clear.

**We add more details to the description and highlight them with underline. They are in Line 414 – Line 415.**

Lines 414-416 : Repetition with Line 393-394. Choose where you want to leave it.

**We delete the repetition in Line 414 – 416 and highlight the change with strike-out line.**

Line 423: ..of the basal and topographic..

**We think it should be “basinal” instead of “basal”.**

Line 429: These studies further have proposed that ... (time concordance).

**We change the writing accordingly and highlight it with underline.**

Line 434: "Cabritos Island". Please point it out in Figure .

**New label of Cabritos Island is added into Figure 4.**

Line 440: Therefore

**We correct this typo and highlight it with underline.**

Line 445-446: The Troies Baies thrust fault,...: the termination structure for the 2010 earthquake.

**We correct this part and highlight it with underline.**

Line 466: "Tapion du Petit Goâve" where in Figure ?

**We add label of Tapion du Petit Goâve in Figure 7. Also, we add reference of Figure 7 in Line 472 and highlight it with underline.**

Line 471: at depth

**We correct this type and highlight the change with underline.**

Lines 472-473: ...7 meters of the lake sediments were cored and dated at 10 Ka...

**We correct this part accordingly and highlight the change with underline in Line 477 -- 478.**

Line 474: ...allows a minimum of 43 ka (NOT 33 ka ; 30m x 10ka / 7m = 43ka)

**We correct this error and highlight the change with underline in Line 479.**

Line 478: .. reveals that the.....sediments are lacustrine and Holocene to the latest Pleistocene in age..

**We rewrite this sentence accordingly. The new sentence is highlighted with underline in Line 483 – 484.**

Lines 481-490: This paragraph is not usefull concerning the main issue of the paper.

**This paragraph is for combining the correlation between the pollen log and the acoustic reflections from the chirp sonar data and extend the age estimation of the upper 7 meters from the log data to entire sonar data set. We add more explanation and highlight the change with underline.**

Lines 490-493: I was not clear to me what is shown in Figure 9B and how it is used to suggest that the most recent rupture in the Miragoâne Lake is related to an historical event in 1770 AD.

**Figure 9 is used to demonstrate the correlation between pollen log and acoustic property (reflectivity). From the log, we find the correlation between pollen log (which essential is the humidity environment when sediments were formed) and the reflectivity. We then use this correlation to extend this humidity-reflectivity relationship to the whole sonar data we acquired from the lake, and then estimate the age of the rupture in the sonar profile in Figure 8B, C (even though there is no log data at the exact location). We explain this part more, combining with the last comment, in Line 497 – 500 and highlight it with underline.**

Line 499: ..as illustrated in ..

**We change “shown” to “illustrated” and highlight it with underline in Line 509.**

Lines 510-513: ...have broader folding wavelengths from 1 to 8 km and a weak seismogenic deformation. On the other hand, InSAR images of the 2010 earthquake indicate smaller folds and more seismogenic deformation in the 10 - 15 km belt north of the EPGFZ.

**We rewrite the sentence accordingly and highlight the change with underline in Line 520 – 523.**

Line 530: Analogy between the 2010 coseismic transpressional... and the1989 Loma Prieta...

**We rewrite this title and highlight it with underline in Line 539 – 540.**

Line 535: ..the south-dipping fault plane. (If speaking about Figure 11)

**We correct this error and highlight the change with underline in Line 544.**

Line 546: surface breaks.

**We change from “ground” to “surface” and highlight it with underline in Line 555.**

Line 550: ..shown in red color..

**We correct this typo and highlight the change with underline in Line 559.**

Line 560: 2 events is a small number to speak about earthquake recurrence cycle, I think.

**Our results agree with the previous study done by Bakun et al. [2012]: The earthquake recurrence cycle along the EPGFZ is about 250 years. We add this explaination and highlight it with underline in Line 568 – 570.**

Lines 576-578: I don't understand what authors want to mean.

**We are trying to say that the EPGFZ was mostly unrupture during the 2010 earthquake, but it still cause the surface uplift on the north (the lowland Léogâne plain) and the subsidence on the south (the highland mountain). This agrees with the geometry of the Léogâne fault. To clarify, we rewrite the sentence a little bit and highlight it with underline in Line 586 – 587.**

Line 579: 2 High-resolution sonar data....northern flank demonstrate the presence...

**We rewrite this sentence accordingly and highlight it with underline in Line 588 – 589.**

Figures:

Figure 1:

Leogâne fault (LF) is not indicated in Fig.1B

**We add LF label to Figure 1B**

In Fig. 1B, put the fold axes in white instead of black (confusing with GPS vectors)

**We change fold axes accordingly.**

In Fig.1C, the fault that separates PAPB and CS is indicated as normal fault, whereas it is mapped as thrust fault in Fig.1B.

**The normal fault in Figure 1C is the interpretation from the Canada company. The thrust fault in Figure 1B is most of the papers agree. Because we don’t have our data of our own, we just respect both of their result.**

Captions :

Line 786 : (BP) is not mentioned in Figure 1A.

**We label it as Bahamas platform in Figure 1A. We change the “Bahamas carbonate platform” in the caption to “Bahamas platform” and highlight the change with strike-out line.**

Line 787: NHM is not mentioned neither; is it NPM instead ?

**It should be NHM in the Figure 1A. We correct this part.**

Line 791: The Cul-de-Sac-Enriquillo basin is not indicated in Figure

**It is the combination of Cul-de-Sac and Lake Enriquillo. To avoid confusion, we change it to Lake Enriquillo and highlight it with underline.**

Line 791: " ..to the eastern tip of the southern peninsula." You mean western tip ?

**Yes. We correct this typo and highlight change with underline.**

Line 793: PAP is PAPB in Figure 1A.

**We correct this error and highlight the new one with underline.**

Line 793: Could'nt find CS (Canal du Sud) in Figure.

**We add “CS” to the Figure 1B.**

Line 794: LA is LM in figure 1B

**We correct this typo and highlight the correct “LM” with underline.**

Line 795: "Figure 3A" is in fact Figure 7A.

**We correct this typo and highlight it with underline.**

Line 795: What is/means and where is "Canadian superior" ?

**It is the name of the company who did the survey. To avoid confusion, we change it to “Canadian Superior Energy Inc.” and highlight the change with underline.**

Line 797: "..offshore Cul-de-Sac-1 well": where is it (could'nd find it) ?

**It is on the left side of Figure 1C. We change the label to “Well : Cul-de-Sac-1” to avoid further confusion.**

Figure 2:

Profiles A-A', B-B' and C-C4 should be in yellow or white instead of red (given the size of the figure, we cannot distinguish them well).

**We change the lines as white with black outline.**

The mentions about Fig.3A and Fig.3B in Figure 2A do not match with Figure 3, but Figure 6.

**We correct this type and change it to Figure 6.**

Figure 2B: The main faults should pointed out with white arrows.

Add the frame corresponding to 2B in figure 2A.

**We add the main fault as red line (to be consistent with the insert diagram) and frame of 2B in Figure 2A.**

Captions:

PapT is PaP in Figure 2A.

DT is DFZ in Fig. 2A ?

Jac > JFZ ?

Gan T > GFZ ?

**We correct all these errors and highlight the change with underlines in the caption.**

Line 806 : ...extending from north-northwest from the EPGFZ" . You mean "... striking west-northwest obliquely with respect to the EPGFZ"?

**Yes. We write this sentence accordingly and highlight it with underline.**

Figure 3:

Put orientation (N and S) in Figure 3A.

**We add orientation to Figure 3A.**

Put Cretaceous in green, and Late Quaternary in light blue or light yellow or beige (to keep the classic international color chart for geological formations). Keep consistent colors throughout the different figures

**We change the colors accordingly.**

What is the red triangle (city I guess) ?

**It is the city. We also add description in the caption and highlight it with underline.**

What means VE (vertical exaggeration ? > useless in Fig.3A since you put the H and V scales)

Put H scales in Fig.3B and C instead of VE=1.

**It is the vertical exaggeration.**

In Figure 3B, change the colors for purple, orange and yellow units. If there're all Quaternary, choose light colors.

**They all belong to Quaternary. We change they into blue palette.**

Are you sure the sub-horizontal orange and yellow units, separated by gentle fold in profile 3B are not the same ? Given the fold geometry and their respective altitudes, they look the same age (maybe not the bottom part of the yellow unit).

**We got this result by citing Massoni, 1955.**

Laurentin Thrust should (LT ?) should be mentioned in Figure 3B.

**By saying Laurentin thrust, do you mean Lamentin thrust? Figure 3B doesn’t cross Lamentin thrust.**

Unless you've got arguments for it, I would'nt place the Dumay thrust on the northern side of Dumay fold, but in inside it.

**We got this result by citing Massoni, 1955.**

What is the red dot in Fig.3C ?

**We delete the mistake from Figure 3C.**

Captions about geological unit in Fig.3C should be consistent with other figures captions + referring to classic international colors chart for geological formations.

**We correct the color palette.**

Captions:

Lines 809-810: delete "on the map".

**We delete them and highlight the change with strike-out line.**

Add A, B and C for profiles A-A', B-B' and C-C' ; and replace A-A', B-B' and C-C' with Figs. 3A, 3B and 3C in Figure 2A.

**We use A-A’ instead of A is because A-A’ also indicates the direction of the cross-section. Using A doesn’t clarify the starting point and ending point of the cross-section.**

Line 810: Léogâne thrust fault or Léogâne fault (LTF or LT) ? Be consistent.

**We change it to Léogâne fault.**

Figure 4:

Figure 4A: Put Lines B6 and L19 in white or yellow instead of black lines (invisible)

**We change the color of these two lines into dark yellow with black outlines.**

(NB : in Google Earth satellite images (2018 Digital Globe image / Quick Bird image), immediatly east of the island (I. Cabritos ?), which is in the middle of Lake Enriquillo, we can see 2 clear en echelon features (folds?) aligning in the E-W direction > This attests of the eastwards extension of the EPGFZ).

Indicate in Figure 4A where are the profiles presented in Figure 6.

**We already indicate these two profiles in Figure 2A. We didn’t indicate them here because of the duplication and crowdedness.**

Figure 4B: I understand what you want to point out (the same depositional environment for both L. Azuey and Enriquillo), but I would leave a space between the 2 lake Chirp line profiles. As it is, we could understand that you want to mean that there are parts of the one same object that has been offset- which does not make sense of course!

Keep consistent colors for lake formations (see my suggestions above).

**We add a white gap between the two chirp profiles. The color we use in this figure is different from the previous ones: it is the different stages divided by Rios et al. [2013].**

Captions:

Line 816: .... Lake Azuey (surface 15 m ASL) and Lake Enriquillo (46 m BSL) are presently...

**We rewrite this sentence and highlight the change with underline.**

Line 818: Replace "this own" by "our".

**We correct this part accordingly and highlight with underline.**

Figure 5:

I find these 2 figures not very useful. I would be more informative to show (at least to add) field pictures of the Lake and its geological environment taken from the mountains, or oblique views of Google earth satellite image pointing out the different features (faults, geological units, etc..).

Put orientations (E-W) and (N-S) in Figures A and B, respectively.

**We add West axis to both figures.**

Figure 1A (if kept): remove the transparent patch indicating the fault scarp. Point it out with arrows.

However, after you put the fault in the Lake, so this is not the fault scarp ..

Delete the dot (.) after A.

**We delete dot from Figure 5A.**

Figure 6:

I am not sure to "see" what point out the EPGFZ fault on the profile: is it the variation of the depth of the red horizon? If so, or whatever it is, explain more please.

**EPGFZ cause the discontinuities of the red and green horizon. Because the nature of the strike-slip fault, there is no elevation change of the horizons, just discontinuities.**

In the same order of idea, how can you be sure of the dip direction of the fault you're pointing out in Figure 6B, north of the EPGFZ. You're interpreting a north-dipping fault, making it a normal fault given the morphology of the offset horizon. But how can you be sure this is not a reverse south-dipping fault? (This would be more consistent with the regional kinematics ...).

**We think this is a misunderstanding: The north dipping fault we are proposing in this paper is the on the north of EPGFZ (in Figure 6B), the Jimani thrust fault, which is more obvious to interpret.**

Captions:

Line 830: Cross sections indicated in Figure 2A are Fig.3A and Fig.3B. As already mentioned, these indications are not correct and too small (you need a lens to see them!). They should be deleted and should be indicated in Figure 4A instead.

**We add a zoom-in view of that part to Figure 2A (the yellow box).**

Figure 7:

In Figure 7A: replace Depth of seismicity by Depth of aftershocks

**We make the change accordingly.**

In Figure 7B: red dot for PG is a city (could be confused with the core location)

**The core location is red dot with cross inside. To avoid confusion, we increase the linewidth of the cross.**

Put lines M1 and M5 in red, white or yellow (invisible in black).

**This is really a tough choice. The bathymetry includes almost all the colors, so maybe black is still the best choice (we did try other colors). To increase visibility, we increase the linewidth and make them as white with black outlines.**

Figure 8:

Figure 8A: Thicken the white arrow pointing out the core location.

**We make the arrow thicker.**

Captions:

Line 844: ... the cumulative topographic scarp associated to the southernmost...

**We change this part and highlight the change with underline.**

Figure 9:

Captions:

Line 849: .. EPGFZ at 1770. ? 1700 what ?

**We change it to “in 17700 A.D.” and highlight it with underline.**

Line 851: "Red bar ....location". This sentence should be in Figure 8 captions.

**We change the writing as “The chirp sonar profiles are from the location of the red bars in the Figure 8B, C.”, highlight it with underline.**

Figure 10:

Use different color scales to better distinguish the topography from the co-seismic elevation change

**We got the InSAR image as it is. We cannot change it. Also, this color scale is very common for InSAR image.**

Captions:

Line 860: Structural map of the southern San Fransisco Bay region...

**We add southern to the title and highlight it with underline.**

SAF: San Andreas Fault; SF: Sargent Fault.

**We add these key to the caption and highlight them with underline.**

Figure 10:

Captions:

Lines 852-853: "aftershock expression of the late Holocene strain partitioning": this means nothing ! Please revise.

**We rewrite this part as “the structural, aftershocks, and the late Holocene strain partitioning” and highlight it with underline.**

Line 854: "Black arrows" ? The two black arrows in the Figure show the westward wrenching of the Gonâve microplate along the Caribbean plate (not its southwest direction!).

**Probably because of the 3D view, but they are pointing at southwest direction …**

Line 854: ..plate. 2010 InSAR....show a large component...

**We change the writing of this part and highlight it with underline.**