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From Associate Pr. Mélody Philippon

to The Editor of Natural Hazard and Earth System Sciences

Pointe-à-Pitre, May the 7th, 2024

Dear Editor,

Please find enclosed the revised version of our manuscript co-authored with M. Philippon, J. Roger, J.F. Lebrun, I. Thinon, O. Foix, S. Mazzotti, M.A. Gutscher, L. Montheil, J.J. Cornée, entitled *"***Forearc crustal faults as tsunami sources in the upper plate of the Lesser Antilles subduction zone. The Case study of the Morne Piton fault system.**" which we would like to be re-considered for publication in NHESS.

Here we submit a revised version of our manuscript. In that new version, we accommodated all the comments and suggestions of the two reviewers and the Editor. The manuscript has been greatly improved and mostly re written taking into account all the suggestions provided by the reviewers (see the attached rebuttal letter with the details of how the reviewers comments have been accommodated). The figures have also been modified according to the reviewers and editor comments.

Along the Lesser Antilles subduction, the possibility to generate a tsunami following slip on the plate interface is debated and the tsunamigenic potential of upper plate faults remains to be estimated. With this contribution, we investigate the Morne Piton fault system, affecting the Lesser Antilles forearc at the latitude of Guadeloupe. We reassess the slip rate of the Morne Piton fault at 0.1 mm.yr^{-1} since fault inception (i.e. 7 Ma) and evidence that slip rate increased up to 0.25 mm.yr^{-1} over the last 1.29 Ma. The unveiled of a metric scarp with striae at the toe of the Morne Piton fault system suggest a very recent fault rupture. Along this fault system, we estimate a rupture area of 100-120 km^2 and then a magnitude range for the seismic event between Mw 6.5 and 7.5. We present results from a multi-segment tsunami model which give an overview of what could happen in terms of tsunami generation if the whole identified Morne Piton fault segments ruptured together and illustrates how submarine features influences the propagation pattern of the tsunami such as (i) shallow water plateaus trigger secondary sources and are responsible for a wrapping effect around the island of Marie-Galante, (ii) canyons are focusing and enhancing the wave height in front of the most touristic and populated town of the island, (iii) a resonance phenomenon is observed in Les Saintes archipelago showing that the waves' frequency content is able to perturbate the sea-level during many hours after the seismic rupture and (iv) evidence the importance of submarine morphological features located at the coast vicinity.

We believe that our manuscript is of broad interest to the readership of NHESS, as the reviewers acknowledged, and is a valuable contribution to the understanding of forearc strain pattern and its potential impact in geohazards. We would be grateful if you could consider it for publication in NHESS.

With kind regards,

Mélody Philippon, on behalf of the co-authors

Statement of the respective role of each author: MP: Conceptualization; Investigation; Visualization; Data curation; Formal analysis; Methodology; Writing - original draft; Writing - review & editing, JR: Conceptualization; Investigation; Data curation; Formal analysis; Methodology; Writing - original draft; Writing - review & editing, JFL: Formal analysis; Investigation; Resources; Writing - review & editing; IT: Formal analysis; Investigation; Resources; Writing - original draft; Writing - review & editing; OF: Validation, Writing - review & editing; SM: Validation, Writing - review & editing; MAG: Investigation; Validation, Writing - review & editing; LM: Resources; Writing - review & editing; JJC: Conceptualization; Investigation; Writing-original drafr, Writing - review & editing.

Reviewer 1#

The study by Philippon and colaborators explores the possibility of upper plate normal faults, perpendicular to the trench, serving as a tsunami source along the Lesser Antilles subduction zone. The Morne Piton Fault system, affecting the Lesser Antilles forearc, is investigated using various data including seismic reflection, high-resolution bathymetry, and dating techniques. The slip rate of the Morne Piton Fault is reevaluated, suggesting a lower hazard level than previously estimated. Evidence of recent fault rupture is found, with an estimated fault rupture area and magnitude range determined. A multi-segment tsunami model depicts potential local tsunami impacts and bathymetric controls on tsunami propagation, highlighting specific phenomena such as wave wrapping around islands, wave focusing in certain areas, and resonance effects lasting for hours post-seismic rupture.

We thank the Reviewer 1# for his suggestions and positive comments that will help us to improve our manuscript.

General comments

The text is well written and easy to follow. Some parts could be shortened, especially in the discussion as I have pointed out below. The geological setting section is extremely long and includes aspects of historical seismicity. I suggest splitting this part into two parts, one on "geological setting" and one on "historical seismicity".

We agree with the reviewer comment and will split the section in three as suggested:

Geological settings, Historical seismicity and Historical tsunami.

The figures are of good quality, although in many of them the texts are extremely small, which makes them difficult to read. I recommend increasing their size and/or rearranging the subfigures. Below I point out details of some specific figures.

We agree with the reviewer comments, we will redraw the figures according to the reviewer suggestions.

I have found some typos which I have indicated in the list of comments.

We thank the reviewer and will correct the reported typos.

In general I liked the work. The tsunamigenic characterisation of these structures, as well as the characterisation of their tectonic activity, is a fundamental aspect for tsunami risk mitigation.

We thank the reviewer for this positive comment.

The data and analyses presented are novel and constitute an important contribution to the knowledge of the active tectonics of the region. The topics covered in the discussion and the methodology used are adequate, however in the part of parameterisation of the faults as a tsunamigenic source I have found several easily solvable errors (as I have indicated below) but which imply repeating the tsunami simulations and slightly modifying some results. Therefore, although the work is well executed and presented, I have to recommend substantial modifications.

Other Observations:

In general the size of the figures and the font sizes are too small. This is specially relevant in figures 1, 2, 4, 5. Moreover, the figures with the seismic reflection interpretation should be the largest (figures 4 and 5) in order to facilitate the appreciation of the details of the structures. Ideally accompanying the interpreted profiles there should be the uninterpreted seismic data.

We will consider these specific comments related to the size of the font and the size of the figures. We will also provide the uninterpreted versions of the seismic profiles along with the interpreted ones.

Lines 107-108 – The authors state that “we reassess the importance of forearc crustal faults as potential major tsunami sources in subduction zones worldwide”, and although they discuss its importance, and the work deals with the problem, it is hardly a reassessment of subductions zones worldwide. Please change the verb to something more modest as "we discuss".

The verb will be changed according to the reviewer’s comment.

Line 112 – Instead of using $cm.yr^{-1}$ please use $mm{\cdot}yr^{-1}$ to be consistent with the rest of the slip rates mentioned in the text. Also revise the format, as the dot “.” is not the adequate symbol for the operation, use the middle dot “·” or even just the “/” in the form mm/yr.

The text will be corrected according to the reviewer’s comment.

Line 116 – The “Montserrat-Bouillante / Les Saintes corridor” is labeled “Harvers-Montserrat-Bouillante Fault system” in figure 1a.

This will be corrected.

Line 145 - “$0.5\pm2\ mm.yr^{-1}$” the error must be a typo(?).

This typo will be corrected.

Line 208 – “under estimation” should be “underestimation”.

This will be corrected.

Line 355-358 – This phrase is odd with the two “was” at the beginning.

This will be corrected.

Lines 359-369 - Is the inundation computed? If it is not computed, how are the coastal boundaries considered in the model? The approximation used to the equations is the linear or the non-linear? (both can be used with COMCOT). The answers should be included in the tsunami model specifications.

The inundation has not been computed as it was not the purpose of the present study. In our simulation settings with COMCOT, we decided that the coastal boundaries are fully reflecting the waves like if it was vertical walls (note that we could have chosen partial reflection, or absorbing boundaries, or something else). In the present study, the tsunami simulations are performed using linear approximation only. These details will be added to the tsunami model specifications.

Line 360 – The “Okada (1985)’s” seems weird. Maybe the authors can use “… using the surface deformation model of Okada (1985).”

This will be corrected.

Lines 429-451 – In this paragraph the authors discuss the deformation rate of the eastern part of the Marie-Galante fault. The only correlatable reflector is pre-tectonic dated at 16 Ma. The authors date the onset of deformation at 7 Ma and use this age to estimate the deformation rate from an observed maximum drop of 995 m, resulting in about 0.15 mm/yr. However, in the previous paragraph they claim that the rate has been constant since 3 Ma with a value of 0.2 mm/yr. i.e. in those 3 Ma it has accumulated 600 m of displacement. If we subtract from the 995 m of jump since 7 Ma the 600 m that occurred in the last 3 Ma we are left with 395 m of displacement for 4 Ma which makes a rate of approximately 0.1 mm/yr from 7 Ma to 3 Ma. Therefore I think that the statement that the rate is constant along the whole fault since 7 Ma is not entirely justifiable, or at least the data are not conclusive. The authors should discuss this possibility.

We agree that the strain rate is not constant. We will modify the text accordingly.

Line 468 – “post-co-seismic” should be just “post-seismic”.

This will be corrected.

Line 475 – In fact using the scaling relations for 0.75 cm the magnitude for Thingbaijam et al. (2017) should be ~ 7.0, 6.7 according to Wells and Coppersmith (1994), and Leonard (2010) does not have a displacement – Mw relation. Considering this, the authors should reword the phrase accordingly.

This sentence will be corrected.

Line 481 – The magnitude Mw should be 6.6 – 6.8 according to Wells and Coppesmith (1994) and Leonard (2010); the values of Thingbaijam et al. (2017) are between 6.5 and 6.7. Under my point of view the authors should have selected a 6.7 event, as is the value which is more coherent with all the parameters estimated. Although it could be seen as a minor change, for the tsunami simulation means that the slip amount is the double using the same other parameters, and consequently the tsunami generated is also doubled. I strongly recommend to repeat the simulations with this increased magnitude, as is key to the calculations of tsunami threat.

The objective of the tsunami simulation presented in the manuscript is to highlight what could happen if the Morne Piton ruptured in totality. We agree that we could have used a Mw 6.7 rupture but we decided to use a Mw 6.5 associated to an estimated average slip of ~0.75 m (the maximum identified scarp value is 2 m), which is the lowest magnitude of the range, in order to be relatively conservative as the displacement value is an approximation. For a complete assessment of the tsunami hazard potential of this fault, numerous rupture scenarios would need to be simulated, including variation of the Magnitude and the coseismic slip, but also, the number of ruptured segments, the width of each fault plane, the slip angle on each fault plane, etc.

Line 497 – The authors state that “Quantifying horizontal run-up at the coast and assessing tsunami risk following rupture along this fault is out of the scope of the present study as such quantifications necessitate a better knowledge of the fault dynamic itself.” This is not entirely true because to quantify the horizontal run-up the only thing needed is a good bathy-topographic digital elevation model and a code capable of computing inundation (as COMCOT, used in this work). I agree that computing “risk” is out of the scope of the deterministic scope of the work. Please clarify this phrase.

We disagree with the reviewer’s comment: the scope of the tsunami simulation presented herein is only to show what could happen in terms of wave generation and propagation within the archipelago, including wave focusing and resonance, using only one scenario of integral rupture of the fault. We are aware that COMCOT allows tsunami inundation calculation and, by the way, run-up calculation. However, providing run-up information to the reader for only one scenario is as useless as dangerous as it could be misunderstood by uneducated readers (in terms of tsunami hazard assessment). Only a detailed study using many scenarios would help to provide accurate results, and this one necessitates a better knowledge of the fault dynamic (i.e., is that able to rupture the whole fault in one time, or separated ruptures, etc.). Concerning assessing tsunami risk, it is also out of scope as it would necessitate a proper vulnerability study, coupled with a detailed tsunami hazard study. The sentence will be clarified in that sense.

Line 505 - “Thus, after showing that the influence of dip on surface deformation is neglectable” this is not true, the dip has influence on the surface deformation as has been shown, for example, in Gibbons et al. (2022). Please consider rewording the phrase or simply delete it.

This sentence will be corrected or deleted. We acknowledge that the dip angle is an important parameter in calculation of the initial deformation generally. However, for this specific study we did sensitivity tests varying the dip with all other parameters constant, and due to high dip values (from 55° to 75°), the results show negligible variation of the initial deformation.

Line 508 – According to my calculations following the data in table 3, the length of the system is 58.486 km and the selected width of the fault is 2.5 km, giving an area of ~ 146 km^2 which is far from the 500 km^2. Using 2.5 km as width has no sense, as the length/width ratio is extremely large and unrealistic. As a consequence of the small area modelled the average displacement has to be incremented to 1.89 m, which is 4 times the average slip for a 500 km^2 rupture area with the same magnitude. If instead of using 2.5 km of width we use 11 km (to have a maximum seismogenic depth around 10 km as is suggested in the text), then we have 643 km^2 rupture area and a displacement of 1.5 m would generate a Mw 6.8 earthquake, a displacement of 1 m would generate a Mw 6.7 earthquake. These magnitudes are coherent with the ones obtained with the previous scaling relationships. I strongly recommend to revise the geometry of the sources to include all the seismogenic depth to obtain a more likely scenario. Also the shear modulus has to be specified. My calculations have been done with 30 GPa.

The length of the fault is correct in the manuscript, the total length of the fault cannot be obtained adding the length of segments of the Table 1 as some segments are “superposed” and roots in depth on the same fault plane i.e. F8 and 9 are located north of and parallel F10 and 11. The “width” column is erroneous in the table 2, it will be corrected as we use a width of 15 km based on Wide Angle Seismic (WAS) profiles and earthquakes data whoih both indicate a seismogenic crustal thickness limited to the first 15-20 km west of Marie-Galante suggesting a brittle-ductile transition at this depth (Kopp et al., 2011; Ruiz et al 2013;

Gonzalez et al., 2017; Padron et al., 2021). We will specify in the text the shear modulus used, i.e. 30 GPa.

Lines 516 - 517 – “dipping globally southward” as is seen in the figures the faults dips northwards.

This will be corrected.

Line 563 – 6.5 and 17 min should be 8.5 and 15 min according to the figure. Please unify.

This will be corrected.

Line 576 – “megathrustthat” shuld be “megathrust that”.

This will be corrected.

Lines 580-640 – Most of the text of this part of the discussion is not related to the work presented, but to previous works. I suggest to reduce this part, specially all the discussion on other fault systems and its historical events.

The paragraph will be shorten according to the reviewer’s request.

Line 658 – “obtain” should be “obtained”.

This will be corrected.

Line 661 - “a rather constant slip rate of 0.2mm.yr^{-1}” as I mentioned before the constant slip rate cannot be extended to the last 7 Ma.

This will be corrected.

Line 677-680 – In this section of text the authors use the word “will” a couple of times declaring the intention to develop some specific research. Although the intention to do so is ok, I think that as this paper does not deal with future prospects this part is not necessary.

This section will be corrected to avoid indicating future projects.

Line 689 - “sensibility tests” should be “sensitivity tests”.

This will be corrected.

Line 690 – “hereinabove” should be “above” or “here”.

This will be corrected.

Lines 692-693 – Another example of canyon focusing is discussed by me in El Salvador (Álvarez-Gómez et al., 2012), but the authors are free to include the reference if they like.

We thank the referee for sharing this information, and the reference will be included.

Line 709 – In figure 10 the peak is marked in 15 min.

This will be corrected.

Line 733-734 – As has been discussed above, the constant slip rate is arguable.

This will be corrected.

Line 738 – I think that Mw 6.7 – 6.8 is a more adequate magnitude.

This will be corrected.

Table 2 – The text is tiny. Please divide the table or rotate it to fill an entire page.

This will be corrected.

Table 3 – There is no need of using 4 decimals in the strike angle, use integers as with dip and rake. In the caption the reference point must be specified, the longitude and latitude are for the centre of the fault plane? For a tip of the fault trace following the right hand rule? For the centre of the fault trace?

This will be corrected.

Longitude and latitude are for the center of the top of the fault planes as highlighted with the blue dots on Figure 7.

References section.

There are several references with italics in the journal name, please change their font style.

Line 806 – Indentation

This will be corrected.

Line 889 – Delete the “

This will be corrected.

Line 1037 – Indentation

This will be corrected.

Line 1042 – Indentation

This will be corrected.

Line 1132 – The title is duplicated

This will be corrected.

The references in the text to Wells and Coppersmith (1996) should be Wells and Coppersmith (1994).

This will be corrected.

References used:

Álvarez-Gómez, J. A., Gutiérrez, O. Q. G., Aniel-Quiroga, Í., & González, M. (2012). Tsunamigenic potential of outer-rise normal faults at the Middle America trench in Central America. Tectonophysics, 574, 133-143.

Gibbons, S. J., Lorito, S., de la Asunción, M., Volpe, M., Selva, J., Macías, J., ... & Løvholt, F. (2022). The sensitivity of tsunami impact to earthquake source parameters and manning friction in high-resolution inundation simulations. Frontiers in Earth Science, 9.

Leonard, M. (2010). Earthquake fault scaling: Self-consistent relating of rupture length, width, average displacement, and moment release. Bulletin of the Seismological Society of America, 100(5A), 1971-1988.

Thingbaijam, K. K. S., Mai, P. M., & Goda, K. (2017). New empirical earthquake source-scaling laws. Bulletin of the Seismological Society of America, 107(5), 2225-2246.

Wells, D. L., & Coppersmith, K. J. (1994). New empirical relationships among magnitude, rupture length, rupture width, rupture area, and surface displacement. Bulletin of the seismological Society of America, 84(4), 974-1002.

Reviewer 2#

Philippon et al. conducted a comprehensive and exhaustive investigation of tsunami hazard to the Lesser Antilles, Guadeloupe Archipelago, posed by a potential worst-case rupture of the trench-perpendicular Morne Piton Fault system. They aim to present this as a case study of forearc crustal faulting in the upper plate of subduction zones, and stress the importance in complementing the common practice of tsunami hazard due to megathrust rupture of subduction zones.

Philippon et al. incorporate methods of seismic reflection, high-resolution bathymetry, Remotely Operated Vehicle (ROV) images of recent submarine fault rupture and dating, in order to parameterize potential worst-case rupture of the Morne Piton Fault. Overall, they identify and map the multi-segment pattern of the Morne Piton fault, reassess its average vertical slip rate (0.2 mm.yr -1), estimate potential offset and maximal area of rupture, and suggest the potential of a multi-segment rupture as a worst case scenario ranging around Mw 6.5 ± 0.5.

Based on these source parameters, they run tsunami generation and propagation around the study area and illustrates its potential impact. They focus on how the local bathymetry affects tsunami propagation in zones of shallow water plateaus and submarine canyons, identify locations of resonance phenomenon, and point towards increase of the hazards.

General

The first part of the title states: “Forearc crustal faulting and estimated worst-case tsunami scenario in the upper plate of subduction zones.”, and this is also stated in the Introduction (“…reassess the importance of…”, lines 107-108). However, the reassessment is limited only to a few lines at the end of the conclusion (Lines 750-755). The Morne Piton case study arises many aspects and questions to deal with, For example, the role of the source mechanism of such faults in tsunami generation, simultaneous rupture with the megathrusts, examples from similar seismotectonic settings elsewhere around the world, past as such events, and more. I suggest either modifying the title according to the actual content of the manuscript or generalizing the understandings achieved in this work and adding a comprehensive discussion.

We agree with the reviewer’s comment: the present paper and related data do not allow us to have a more general discussion on the role of upper crustal fault as tsunami sources worldwide. We will reformulate the introduction and remove the reassessment part, however we will let the five lines concerning the reassessment in the conclusion. We propose a new title: Forearc crustal faults as tsunami sources in the upper plate of the Lesser Antilles subduction zone. The Case study of the Morne Piton Fault system.

While discussing tsunami hazard to the Lesser Antilles due to subduction megathrust and forarc crustal sources, it would also be relevant to mention the role of tsunamigenic submarine landslides.

A sentence about tsunamigenic submarine landslides will be added, with related references on identified submarine scars and deposits in the region. “Landslide sources are also known for their tsunamigenic potential. There are more and more studies led to assess the hazard associated to these “silent tsunamis” (e.g., Roger et al., 2024). In the Caribbean Region, a few tsunamis triggered by landslides and/or pyroclastic flows have been reported in catalogues of events (e.g., O’loughlin and Lander, 2003; Accary and Roger, 2010), bathymetric surveys helped to identified large submarine landslide scars and deposits (e.g., Deplus et al., 2001; Le Friant et al., 2009, 2019) and a few studies have highlighted the capacity of these landslides to trigger large tsunamis (e.g., Smith and Shepherd, 1996; Teeuw et al., 2009; Leslie and Mann, 2016).”

Associated references:

Deplus, C., Le Friant, A., Boudon, G., Komorowski, J.C., Villemant, B., Harford, C., Ségoufin, J. and Cheminée, J.L., 2001. Submarine evidence for large-scale debris avalanches in the Lesser Antilles Arc. Earth and Planetary Science Letters, 192(2), pp.145-157.

Le Friant, A., Boudon, G., Arnulf, A., & Robertson, R. E. (2009). Debris avalanche deposits offshore St. Vincent (West Indies): impact of flank-collapse events on the morphological evolution of the island. Journal of Volcanology and Geothermal Research, 179(1-2), 1-10.

Le Friant, A., Lebas, E., Brunet, M., Lafuerza, S., Hornbach, M., Coussens, M., Watt, S., Cassidy, M., Talling, P.J. and IODP 340 Expedition Science Party (2019). Submarine landslides around volcanic islands: A review of what can be learned from the Lesser Antilles Arc. Submarine Landslides: Subaqueous Mass Transport Deposits from Outcrops to Seismic Profiles, pp.277-297.

Leslie, S. C., & Mann, P. (2016). Giant submarine landslides on the Colombian margin and tsunami risk in the Caribbean Sea. Earth and Planetary Science Letters, 449, 382-394.

O'loughlin, K. F., & Lander, J. F. (2003). Caribbean tsunamis: a 500-year history from 1498-1998 (Vol. 20). Springer Science & Business Media.

Roger, J.H., Bull, S., Watson, S.J., Mueller, C., Hillman, J.I., Wolter, A., Lamarche, G., Power, W., Lane, E., Woelz, S. and Davidson, S. (2024). A review of approaches for submarine landslide-tsunami hazard identification and assessment. Marine and Petroleum Geology, p.106729.

Smith, M. S., & Shepherd, J. B. (1996). Tsunami waves generated by volcanic landslides: an assessment of the hazard associated with Kick'em Jenny. Geological Society, London, Special Publications, 110(1), 115-123.

Teeuw, R., Rust, D., Solana, C., Dewdney, C., & Robertson, R. (2009). Large coastal landslides and tsunami hazard in the Caribbean. Eos, Transactions American Geophysical Union, 90(10), 81-82.

The heading of section 4.4 (Related tsunami hazard) does not express its actual content which in fact deals with tsunami modelling/simulation and the resulted hazard.

The section has been relabeled: Plausible worst-case tsunami scenario and resulting hazard.

Section 5.1 presents technical overview of the potential tsunamigenic sources in the study area one by one. What would be the combined effect (e.g,; recurrence time) of all these sources on tsunami hazard to the Lesser Antilles, Guadeloupe Archipelago?

We could have hypothesized on a combined rupture of these faults however our present-day knowledge of the strain, recurrence time and kinematics of these faults it too scarce and incomplete to establish their abilities to rupture together (contagious fault rupture seems unlikely due to their spacing), they may be activated by remote dynamic triggering but we lack data to evaluate this potential. Moreover, having potential partitioned rupture (I.e. a megathrust rupture combined with an overriding plate fault rupture) along the Lesser Antilles trench as never been investigated as in the area, a single historical earthquake is debatably attributed to the megathrust and occur before the instrumental seismicity era.

What is the added value of section “5.2. Slip rate reassessment along the Morne Piton Fault system” with respect to section “4.2 Vertical slip rate estimates along the Morne Piton Fault system”. Would it be useful to combine the two sections?
This section is important as we re-evaluate the slip rate and show that it is four times slower than previous estimates. We thus will keep this paragraph. We will also add an introductory statement indicating the importance of this discussion sub-section:”With this study, we evidence that the slip rate along the Morne Piton fault system increases through time with a maximum slip rate of 0.25 mm·yr^{-1} since the last 1.29 Ma. This slip rate is four times slower than previous estimates.”.

Technical comments
Please check capital letters spelling of “KaShallow / kashallow”
This will be corrected to KaShallow.
Section 2 is very long. Consider dividing to subsections.
This will be corrected according to the suggestions of both reviewers.
Line 276: Right side parenthesis is missing.
This will be corrected.
Line 380-398: Before detailing the segmentation of the Morne Piton Fault, please explain the criteria used for subdivision.
We added the following sentence: The morpho-bathymetric analysis allows to identify superficial segments of the faults that are reaching out the seafloor.
Line 441: Please check for dots instead of commas
This will be corrected.
Lines 500-514 deal with rupture parameters of the Morne Piton Fault and may belong to the previous section “4.3 Earthquakes parameters of Tsunami modeling”?
This will be corrected.
Line 537: Do you mean the negative amplitude of the first arrival?
Yes, that will be clarified this way.
Lines 539-542: Please refer the reader to the relevant figure (9?)
This will be corrected.
Line 544: First reference to Figure 9 appears after reference to Figure 10 (Line 537)
This will be corrected.
Line 567: Phrasing of heading “5.1. Implications a local and regional scales” is not clear. Please make sure the heading reflects the content of this section.
The title of this sub section will be corrected: Implication at local and regional scales.
Lines 567-591 in Section 5.1: First and most of the second paragraphs seem to belong to the Introduction and in fact present the rational and motivation for this work.
We wrote this paragraph in order to widen the discussion from local to regional scale. We want to keep this regional overview in the discussion. The introduction already present the movitation and rational for this work: present a worse case tsunami scenario with the Morne Piton fault system as a source.

Line 660: Phrasing of “…but it instead probably”?
This will be corrected.
Line 682: the heading “5.3. Tsunami simulation” is too general and does not express the content of the section.
This will be corrected,changing the title of this subsection to:“ *Bathymetric features control on tsunami wave propagation”.*
Line 729: Conclusion or Conclusions?
This will be corrected.
Some Longitudes of the study area are presented with negative values (e,g, Figure 7, Table 3), or without (Figure 1), or from E (Figure 8). Consider unifying the convention or mentioning the relevant format in each case.
This will be standardized.
Figures

Figure 1

- Consider expanding the area covered in panel A in order to present a wider perspective of the tectonic setting around the study area and better present what the text (Limes 70-71) says: “as the north and south American tectonic plates slowly subduct under the Caribbean plate”.
- Please add color scale to bathymetry depth;
- Some fonts are too small;
- Are slab depth by km?
- Location of the Morne Piton Fault?
- The text “Figure 3” is hidden below the white bathymetry lines;
- Please verify delineation the areal extent of Fig 3

The corrections suggested by the reviewer will be done.

Figure 2
Some writings are too small and faint to read.
We will change the font size accordingly.
Panel C: Consider highlighting M>5 or even M>4 events.
We highlighted the M>4 events.
Figures 3B and 7
It is not clear which are the F8-F11 segments. F8 and F9 seem to refer to the same continuous line above the writing? Same regarding to F10 – F11?
We will clarify the figure according to the reviewer comment.
Figures 4-6
Some writings are hard to read, they are too small and faint.
We will change the font size accordingly.
Figure 8
Couldn’t see the black arrow, site name symbols are missing
We will modify the figure 8 accordingly.
Figure 9
Numbers of the virtual sea-level gauges, names of localities and bays are too small and faint to read.
We will change the font size accordingly.

Maximum wave elevation: do you mean maximum elevation achieved during the 10 hours of simulation?
Yes, the maximum wave elevation is the maximum value reached on each point of the grid domain over 10 hours of simulated propagation.

Tables

Table 1
Some lines under the Aguadomar column are gray rather than black.
We will correct the table accordingly.
Table 2
Fonts and resolution are too small.
We will change the font size accordingly.
Table 3
Please check the width (2500 m) parameters. Line 479 speaks about 10 – 15 km seismogenic crustal thickness. Should it be 12,500 m?
This will be corrected with the actual values used for the simulation.
Any relevance of presenting four decimal places of the coordinates and the strike?
No relevance, it will be corrected.
Please refer to the above comment regarding Figures 3B and 7.
It will also be corrected.