Thank you for the helpful comments on our manuscript. Please find below our response and modifications that we have revised in the manuscript following the comments and suggestions.

Editor #1

Comment #1-1. As the Reviewer #1 suggests, the current paper does not fully demonstrate the relationships among the UAS-derived geological interpretation of the fault, independent InSAR LoS interpretation, and the inferred deformation model of the fault. I am not aware of the "classical geological way", but the mixture of methods/results/interpretations for each topic in the current manuscript seems to make it difficult for readers to figure out what is the new point of this study. To avoid this, I would recommend to restructure the entire manuscript (as I originally suggested), or at least, make clear steps in each section of different methods.

Response #1-1: Contrasting to what is said we followed as plan of our paper (1) the Location of active faults by doing photointerpretation in this area made of alluvial and muddy lithlogies and where no faults are outcropping. It is first needed to locate active faults from UAS indirect approach then morphostructural analyses then to characterize all tectonic features before regarding the quantification of the structural displacements. We believe that our plan is clear, and pedagogic.

Comment #1-2. Moreover, as listed below, there are too many issues that have not been correctly addressed in the authors' revision. It is necessary to clarify all the issues.

Response #1-2. Excuse us for this we do not realize that some had been not fully modified.

Comment #1-3. "we confirm herein our interest to work in the NHESS paper on the whole onshore Hengchun Fault area that is covered by the UAV survey. For instance, the leveling lines 2 (Fig 9) confirm the LOS INSAR displacement of the Hengchun Fault in the southern part.

>> This is not true, as the area of interest of InSAR shown in Fig. 1 is apparently different from the area of leveling survey shown in Fig. 9. Eastern half of both of the leveling survey lines are out of the range, but still values of LoS are given along the line (Fig. 9b, c).

Response #1-3: We follow your suggestions and modified the figures in order to get the same studied area for all the paper. Consequently this comment seems out of scope with this new version.

Comment #1-4 P2 L10: Clarify or remove “by previous authors”. Also, use “e.g.,” instead of “; among others” and When “e.g.,” is used, “etc.” is unnecessary.
Response #1-4: Done

Comment #1-5. P2 L11: Avoid using “…” (also for the other portions in the manuscript)
Done >> Not corrected. It remains in many places throughout the manuscript.
Response #1-5: Corrected.

Comment #1-6 P2 L20: Explain “PS-InSAR” here. Particularly, the definition of “PS” is missing throughout the manuscript (c.f. P5 L21, 22).
Done
>> Still missing is the explanation of InSAR (at least, it should be spelled out).
Response #1-6: Now, it is spelled.

Comment #1-7 P4 L5: "work in progress" This wording often appears in this manuscript, but it may not be suitable to regard it as something like a citation. Better to be removed and clarified as a future issue.
We removed the (only) two "work in progress" written in this paper >> >> Not corrected. There still remains this wording in the manuscript.
Response #1-7: We removed all 'work in progress' in the ms... Moreover we remove anything which could give working perspectives in this area.

Comment #1-8 P6 L1: The methodological description of “GPS measurement” is missing.
We precise the GPS data used to validate our PS-InSAR results.
>> The details of the “GPS measurement” is still unclear. The authors seemed to use data from static GNSS stations for revealing displacements, as well as kinematic GNSS measurements for GCPs, but these details are not properly provided (some missing and some unclear). Also, detailed description of airborne LiDAR is missing. As noted above, clear descriptions of the methodologies, as well as their results and interpretations, are necessary to be provided separately.
Response #1-8: A paragraph had been added with a new figure (Fig.3), As this paper is not focus on GPS paper, we did not emphasize too much on it, the reference Yu S.B., et al. 1997 is here to fulfill further queries.

Comment #1-9 Figure 1 caption: “Figure 1a:” --> "(a)", also for b and c.
Done >> Not done.

Response #1-9: We redraw the Fig 1 and with a, b, c…

Comment #1-10 Figure 1 Area of Interest: ... Moreover, the whole leveling line 2 and the eastern half of line 1 are apparently out of the extent of Figure 8, and it is unclear how the PS values were obtained for these areas. These inconsistencies should be clarified.

Response #1-10: We modified the study area in order to have the same for all figures.

Comment #1-11 Our study area correspond to the onshore Hengchun Fault covered by the UAS survey acquired and shown in Fig. 2. Some figures present a smaller extension due to potential political conflicts with sensitive Taiwan infrastructures (Nuclear PowerPlant N°3). >> This is not the point, as noted above at (1)

Response #1-11: Due to the modifications of the extension of the figures this comment seems out of scope for instance the figures cover effectively the leveling part in the Hengchun Fault area.

Comment #1-12 Figure 4: Put (a)-(c) in the panels. Better to show the photo location anddirection in Figure 2.

Done >> Not corrected. Also, Figure 2 shows the photo location but the direction is unclear.

Response #1-12: The Fig.6 (photograph in the fields) was out of the perimeter of former Fig.1 that is why we added in the previous version submitted in july 2017 the GPS coordonates. As the readers may want to see the exact location of Fig.6, we enlarge to the north Fig1 in order to locate the outcropping fault (red dot) and the Fang-Shan Village.

Comment #1-13 Figure 5: … Also, "Fang-Shan village" is not shown in Figure 1.

GPS data was and is still given in the legend. >> >> It is never seen anywhere else in the manuscript.

Response #1-13: Fang Shan village is added on Fig.1 in this new version.

Comment #1-14 Figure 6: It would be better to show the rectangular extents of the example areas of Figure 3 (same as in Figure 1). Red (2) and pink (8) lines are hard to differentiate.

This important figure 6 is difficult to read and we would like to avoid to add too many things on it not directly linked to the thematic... that is why we have chosen to draw the quadrangle on Fig. 2. >> Still I cannot clearly identify the pink (8) lines.

Response #1-14: We removed Pink 8 lines in the legend as theyw were difficult to see on the W coast... see original figure of first submission 31st january 2017.

Comment #1-15 I understand putting less information is better, but still do not understand the correspondence between the coverage by the UAS-derived data and that by the "morphostructural map". Does the western margin of "9: Hengchun valley alluvial and marine deposits" overlaps with the area? If not, how was it mapped?

Response #1-15: the western part of the index 9 has been mapped from the concave shape of the 5m DTM which is situated in transparency in the background of this figure 9. This drawing is basic and common sense from geological mapping: mapping the external limit of flat soft lowlands that correspond to alluvial and marine deposits in such environments. Few of the region outside of the UAS mission area, the existed low resolution DTM was inferred, e.g. 5m DTM.

Comment #1-13 Figure 8: If the current A and B show the same displacements, the left one can be omitted. The schematic model of LOS (graphic description including satellite) should be placed in a separate panel, and the flight direction and LOS could be placed in the map panel (like Figure 1).

Ok we remove the Fig 8A, we redraw that figure >> Panel A was removed but the other points were not addressed.

Response #1-13: We separate the different drawings with specific independent quadrangle. Thanks to confirm it has been done in this new version.

Anonymous Referee #3

Referee #3-1. The main two resulting products are newly interpreted Hengchun Fault in Fig. 6 and the offset of mean LoS velocities between eastern and western part from the Fault. And the authors make an assertion of the active inter-seismic tectonic deformation model of the Fault.

Response #3-1: The purpose of this NHESS submitted paper is to locate, characterize and quantify for the first time the active Hengchun Fault in Southern Taiwan by combining GPS, levelings, PSInSAR and by a detailed photo-interpretation of the high resolution and high precision UAS-DTM and orthophoto of the Hengchun fault area through a precise Morphoneotectonic map of the Hengchun Fault. Contrasting to what was known and published before (see the references), we reveal and quantify herein for the first time the active displacement that affect the Taiwan Nuclear Power plant N°3 and its surroundings.

Referee #3-2. However, the newly interpreted Fault plays a minor role in the proposed tectonic deformation model. Even if detailed distribution of the Fault is revealed using UAS products, the authors do not explain how the distribution effectively works in order to propose the tectonic deformation model nor mention how the distribution differentiates the new model from the previous models. Relation between the detailed interpretation of the Fault and the proposed model is vague.

Response #3-2: To this point, the authors listed 3 points as follows:

1. The aim of this paper is not a structural and tectonic analysis in, and only in, the fields of the Hengchun fault as it is not possible to figure out the full frame of the study area from outcropping. Classical microtectonic studies are not possible to carry on in the muddy Kenting Melange and along the alluvial deposits of the Hengchun fault. That is why we develop in this NHESS paper a new approach based on a combination of morphotectonic approaches that associate to various complementary quantitative observations.
2. This paper focus on the new inputs of UAS and its derivative products (DTM and orthomosaic) and their structural and tectonic interpretations (morphoneotectonic map) combined to GPS, PSInSAR interferometry and leveling to better understand the active Hengchun Fault in Southern Taiwan. One may note that this paper was not associate with an EGU tectonic session ! If the paper was dedicated to a tectonic session it would have been written differently with different dataset...
3. On the other hand, the global and continuous uplifting through time and subsiding on both sides of the Hengchun fault deformation of Fig. 10a, b, c and Fig.11 and 12 reveal the progressive folding and the coherence of the proposed tectonic model in this NHESS issue.

Referee #3-3. The authors made a crucial mistake that LoS change stands only for vertical component of deformation, i.e., uplift and depression. LoS changes include not only vertical component but also horizontal component of the deformation, however, the authors do not explain enough why vertical component should be paid attention and why horizontal component is not considered.

Response #3-3: Indeed, the InSAR result reveals only the LoS deformation. That is why in this study we integrated many aspects including: GPS, leveling InSAR and UAS data, so as able to decipher the activity deformation of the Hengchun fault and nearby area. The PSInSAR results are compared to 3 fixed absolute GPS data (Fig.1) and two E-W leveling profiles (Fig.10a, b, c) that give the vertical displacement. Our result is fully coherent and evidenced clearly a simple deformation of the Hengchun

Peninsula (see new Fig. 7, 10a, b, c, 11, 12, and the model Fig.14). The GPS and the two leveling profiles of Fig.10a, b, c, and 11 reveal the vertical component of the active inter-seismic Hengchun fault displacement and its surroundings during the same InSAR monitoring time period. Please read carefully the manuscript. Thus, there is no "CRUCIAL MISTAKE", we are fully able to differentiate the planimetric and vertical absolute component through GPS fixed stations, leveling and combined to PSInSAR data.

Referee #3-4 Fig. 4 infers left lateral movement and Fig. 5 infers EW compression, however, the reviewer could not catch the relation between the newly interpreted Fault and such the field observations. Furthermore, the authors did not mention how the horizontal component of the deformation is interpreted from the LoS change velocity to propose the new model.

Response #3-4: Transpressive motion is the structural/tectonic term where both thrusting and lateral strike-slip motion prevail on the same tectonic fault. It is a basic structural and tectonic notion associated to partitioning of the deformation used in this paper to explain the displacement of the Hengchun Fault which is both transpressive and left-lateral.

Contrasting to what is said The Chelungpu fault that was reactivated during the Chichi earthquake present both this left-lateral transpressive displacements (see the references on chichi earthquakes). Effectively the motion of the Hengchun Fault of Fig.5, 9, 14 is deduced from the GPS fixed station represented in Fig.1. It is common sense and cited the paper Chang et al (2003). In our NHESS paper, the authors illustrated and documented carefully Fig.6: the lateral component in between the hanging wall and the footwall wall of the outcropping. The fault confirming both a compressive motion and a lateral motion (see Fig.6) that we propose in the regional geodynamic model of Fig.14. And confirmed by all field geodetic measurements (GPS, Levelings, PSInSAR and Field Work).

Referee #3-5. Therefore, the reviewer thinks that it is difficult for the reviewer to judge the acceptance.

Response #3-5: To summarize, in this NHESS paper our PSInSAR results are compared to GPS absolute deformations (Fig.1, 10a,b,c and 11), and 2 field levelings (Fig. 10a,b,c and 11) that give with no doubt the vertical component of the deformation of the Hengchun fault and of the whole southern peninsula. All is coherent and reveal the simple tectonic model of Fig.14. Of course the deformation deduced from the PSInSAR is only 1D and along the Line of Sight (LoS). That is the reason that in this study we integrated many aspects including: GPS, leveling InSAR and UAS data, so as able to decipher the activity deformation of the Hengchun fault and nearby area. Due to the above remarks, the authors regret for the unfaithful and incautious judgment.

Anonymous Referee #4

Referee #4-1. Somewhere in discussion could you emphasize the improvement of using the UAS derived DTM than the 40m DEM? I cannot easily see what can only be resolved with using the new DTM.

Response #4-1: We add the Fig.3 and a paragraph on it, explaining the differences.

Referee #4-2. Page 2, Line 10: I am not sure whether using exclamation point is the best choice of punctuation in this sentence.

Response #4-2: We remove it.

Referee #4-3. Page 2, Line 13: Indicate the power plant in Fig. 1.

Response #4-3: We add it, See orange circle (3)

Referee #4-4 Page 2, Line 21: Write down the full name of InSAR when first mentioned it.

Response #4-4: we add: Persistent Scatterers-Interferometry Synthetic Aperture Radar (PS-InSAR hereafter)

Referee #4-5. Page 3, Line 8: Delete "…".

Response #4-5: We removed in the text of 3 places where "…" remained

Referee #4-6. Page 3, Line 9: "Eighteen" instead of "18" in the beginning of a sentence.

Response #4-6: now it is: Eighteen (18) ground control points

Referee #4-7. Page 5, Line 12: "in" Figure 6

Response #4-7: Done, and now is in Fig. 7.

Referee #4-8. Page 5, Line 21: Need a full citation of Chen's report.

Response #4-8: We cited it and add it in the reference.

Referee #4-9. Section 4: Where is the reference point for the PS analysis? Please indicate the location in Fig. 8.

Response #4-9: Reference points for the PS analysis are white star (4) in Fig 9, it is (and it was) indicated.

Referee #4-10. Page 6, Line 1: might be submitted to → might be subject to.
Response #4-10: Done

Referee #4-11. Page 6, Line 16: Dealing with the Kenting → "Regarding the Kenting" or "With regard to Kenting".
Response #4-11: Regarding the Kenting Fault…

Referee #4-12. Page 6, Line 25-26: Do you mean that the GPS LOS velocity is converted from leveling measurements and GPS horizontal measurements?.
Response #4-12: No, GPS measurements are deduced directly from fixed stations existing in Taiwan. Levelings is a completely independant work and dataset had been processed by Lin Kuan-Chan and Hu Jyr-Ching (co-authors of this NHESS paper).

Referee #4-13. Page 6, Lines 14 and 17: Please avoid using "…".
Response #4-13: Done

Referee #4-14. Page 7, Lines 26: How is the creeping value estimated? If you refer to the difference of surface velocity between the west and east of the Hengchun fault (in stead of creeping along the fault), I will suggest saying "difference in interseismic velocity between west and east of the Hengchun fault with a value of 8 mm/yr". Based on the figure it looks like 8 mm/yr instead of 0.8 mm/yr..
Response #4-14: We agree, we modify it as the reviewer proposed. Yes we put all values of velocities in mm/yr (avoiding cm/yr). We change all velocity units in mm/yr. BUT DTM Resolution and precision are still in cm...

Referee #4-15. Page 8, Lines 6-8: I know this is a schematic model figure, but could you infer the dip angle along strike of the Hengchun fault? Is it a high or low angle fault?.
Response #4-15: Please refer to the cross-section in Fig.1c, and the Hengchun is vertical due to the rectilinearity mapping, Kenting Fault is low dipping fault so as to demonstrates its sinuosity. It was (and is still) also explained in the text, page 8 Line 22. We add Hef... "an almost vertical" fault.

Referee #4-16. Page 8, Line 12: present both left-lateral strike-slip and thrust dip-slip components such as ....

Response #4-16: Done.

Referee #4-17. Page 8, Line 13: Could you provide more examples of faults with this oblique component property?

Response #4-17: We modified as: Chelungpu Fault, etc. (Deffontaines et al. 1997)

Referee #4-18. Page 8, Line 14: Please avoid using both “cm” and “mm” in the same paper.

Response #4-18: Done. We change all velocity units in mm/yr. BUT DTM Resolution and precision are still in cm.

Referee #4-19. Page 8, Line 116-18: I think this comparison is a bit unfair, as the InSAR derived velocity is in LOS, whereas vertical from marine terrace dating results. If the authors know the fault dip angle they should try fault inversions using different datasets, and then compare the inferred slip in geologic and geodetic time scales. Also I suggest saying “geodetic slip rates” instead of “instantaneous slip rates

Response #4-19: As levelings give us the vertical component of the deformation, the GPS fixed station give us the absolute deformation, thus it is possible to compare the marine terrace dating results. And consequently it is possible to make this comparision.

Yes it is possible to inverse the deformation dataset as we know the Fault dips. However, it is not the aim and the scope of this UAS/NHESS paper. By the way, we are doing this tectonic work independently on a global study of the whole Hengchun peninsula, and planning to submit the study in a Structural/Tectonics journal.

“geodetic slip rates” modification done.

Referee #4-20. Page 9, Line 14: PS km-2.

Response #4-20: Done.

Referee #4-21. Page 9, Line 16: the highly dipping Hengchun Fault → the Hengchun Fault with high dip angle.

Response #4-21: “the Hengchun Fault with high dip angle” Done.

Referee #4-22. Page 9, Line 16: Choose either “interseismic” or “inter-seismic” throughout the manuscript.

Response #4-22: Done, “interseismic” is used in this manuscript.

Referee #4-23. Page 9, Line 23: due to (1) xxx, (2) xxx..

Response #4-23: Done.

Referee #4-24. Page 9, Line 23: to the low fault dip angle deduced from ….
Response #4-24: Done.

Referee #4-25. Page 9, Line 27: Suggest using "Nevertheless" than "Anyway".
Response #4-25: Done. "Anyway" replace by "Nevertheless".

Referee #4-26. Figure 3, Line 9: I cannot find NPP and MV in the figure.
Response #4-26: We indicate NPP on Fig.1, but removed MV.

Referee #4-27. Figure 8, Looks like the PS points in the southernmost part are not plotted, as they are shown in Fig. 9 in comparison with leveling measurements.
Response #4-27: We modified and redraw Nearly all figures in order to have the same studied area... Please see Figs. 1, 2, 3, 4, 5, 9, 10, 12, 14.

Referee #4-28. Figure 9: How the InSAR error bars were estimated?
Response #4-28: 90% of confidence.

Referee #4-29. Figure 10, Is the label (2) needed in this figure?
Response #4-29: Effectively It has been removed.

Referee #4-30. Figure 11, Is this figure showing offset between the hanging wall and the footwall? Where is the GPS measurement (HENC?) relative to?
Response #4-30: Yes. The GPS measurements (HENC) is relative to a Penghu-Taipei Line (see Yu S.B. et al., 1997). However, we do not develop too much this aspect as it is not the topic of this paper.