

Reply to Reviewer 2

We sincerely thank Sarah Weihmann comments and constructive criticisms. We are confident that these suggestions will significantly help us improve our study.

Below, we provide a point-by-point reply to all of Sarah Weihmann's comments. We appreciate her for also highlighting the paper's limitations and weaknesses, which we have carefully addressed.

Based on this revision, we improved the Introduction section to make the paper's questions and results more consistent. Additionally, we revised the language to improve tense consistency for greater fluency, modified the figure captions to better address the figures, organized the paper's storyline, and refined the conclusions. We have strong evidence from both solid seismic observations and field geologic analysis that supports assigning these subsurface structures to hydrothermal vents.

- To be clear, we organized this document line by line following the main comment, with Sarah Weihmann's comments and suggestions highlighted in black italic and our answers in blue.

Main points of Sarah Weihmann:

- Manuscript appears a little unfinished, drafty
- Language could be more fluent
- Figures need better addressing and need to back up the storyline/conclusions better
- Storyline could be more consistent (research questions, study aims, results)
- Tense changes must be avoided
- At times it remains unclear if findings relate to own work or refers to others.

Re: We really appreciate all the comments you made, highlighting our limitations. We consider each of your comments, questions, and concerns to be essential, which is why we have implemented all the changes you suggested. With your suggestions, we substantially improved the paper and refined how we present our introduction concepts, results, and discussion.

LINE -22: *Spelling: Correspondence.*

Re: Done.

LINE 31: *Variance attribute comes sudden and without explanation and introduction. Please introduce and link better.*

Re: We changed the sentence to introduce better and explain this. Thank you for the suggestion.

LINE 32: Delete “the”. Generally, the language style would benefit from using less articles.

Re: Done.

LINES 32: Generally, the language style would benefit from abandoning first person plural (we, our, us..) and keeping it neutral instead (results show..)

Re: Done. We deleted and kept neutral as you suggested.

LINE 33: 33: Delete “the”

Re: Done.

Line 33- “enhance permeability” – How? Proof?

Re: To better explain the sentence, we changed this term.

LINE 33-34: “starting from ... boiling processes” - What does this mean? What are boiling processes?

Re: We followed the statement and the definition from Planke et al. (2005), which describes boiling processes as beginning simultaneously with hydraulic fracturing in the vent system.

LINE 37: Grammar: Article missing

Re: Thank you for your suggestion. We added the article.

LINE 38: Please don't use first person plural, change to indirect speech

Re: Done.

LINES 39-41: Petrophysical implications are not mentioned again after the introduction (line 47). The claim needs more substance. Silicification processes are

not mentioned again after the geological setting (line 201). The claim needs more substance.

Re: We deleted the terms to clarify this better.

LINE 59: Gas, mixed fluids, hot water: All of them are fluids. Reword?

Re: Done. We reword to make sense.

Lines 61-66: First sentence is incomplete or lacks depth. Combine sentences? E.g. “While hydrothermal vents are associated with igneous intrusions, their processes and rock parameters, controlling pathways and conduit architecture, remain poorly understood.”

Re: Thank you for the suggestion; we used your sentence combination.

LINE 82/84/88/89: Fig 1: Swap images 1A and 1B to fit the text flow

Re: We revised Fig.1 following your suggestion.

Lines 83: Change have to has

Re: We could not find the term to change.

LINE 83: “concordant, divergent or truncated patterns” – is not identical with description in Fig 1; Generally, please incorporate figure descriptions more detailed and precisely in the text.

Re: We rewrote to keep the description identical with Fig 1, as you suggested.

LINE 106: Delete second “the”

Re: Done.

LINE 109: Add: “In several studies...”

Re: Done.

LINES 125-127: “To answer the above questions” - This is too strong. Unless all above questions are fully answered by this study (mechanisms of propagation and nucleation, link to preexisting fault zones, controls on final architecture, dependence on overpressure-drive intrusive mechanisms, re-exploitation of existing architecture,

influence of host rock properties on architecture development), this should not be worded like this.

Re: We removed this part of the sentence to follow your suggestion.

LINE 127: Grammar: Tense change. Stay in one tense! Present tense is recommended.

Re: We adjusted the verbs in the present tense as you recommended.

LINE 129: Use indirect speech please

Re: We changed to follow your recommendation.

LINE 130-131: Write numbers up to eleven in words rather than numbers.

Re: We re-wrote the numbers following your suggestion.

LINE 132: Delete “the”; Use indirect speech please.

Re: Done.

LINE 134: Add “that”

Re: Done.

LINE 135: Delete “the” (2x)

Re: Done.

LINE 135: Delete “and”

Re: Done.

LINE 127-138: This paragraph on study aims does not fit the questions raised in lines 116-124

Re: Following your suggestion, we changed the sentence to fit the questions raised in lines 116-124.

LINE 142-145: This phrase is overloaded. Possibly split for better reading flow.

Re: Done.

LINE 149: Fig 2A/B: Arrows clutter the figure. Please use lines. Fit scale in bottom right corner matching Fig 2C. Fig 2C suggests focus on water and Paleogene from colour choice. Better balance weight of colour. E.g. checkshot well: black (why green?); highlighted features: solid colours only (why water?); related features:

colour families (why water and Jandeira formation blue?); 3D seismic: black patterned area (why pink outline?); 2D seismic line: black (why dark red?).

Re: We made the changes suggested in Fig. 2. The colors of each feature on the map were selected from geologic stratigraphic color tables to make them visible.

LINE 171: Grammar: Align tenses

Re: Done.

LINE 186-190: Please rephrase, paragraph reads poorly and unstructured. When mentioning three events, number them accordingly (e.g. 1), 2), 3) or first, second, third), and structure them by theme, here time, to create a better storyline.

Re: We rephrase the paragraph, adding the terms suggested here.

LINE 191: “On the surface of our study area” – geographically, thematically, geologically? Adjust wording.

Re: We added the term ‘geographic’ to clarify the sentence.

LINE 191: Grammar: pipe structures

Re: Done.

LINE 192: “described before” – Where? Reference please.

Re: We added the corresponding reference.

LINE 200: “This study highlighted – Change tense please. Which study is being referred here? Their own? Menezes’? Very unclear.

Re: We rewrote the sentence, changing the verb tense and clarifying who is being referred to.

LINE 204+278 + 446: Consecutive headers should generally be avoided – Possibly introduce a sentence here?

Re: We deleted the headers that were pointed to, avoiding the consecutive ones as you suggested, and then added a sentence to introduce the paragraphs.

LINE 208: Use indirect speech please

Done.

LINE 211/212: How near? More precision appreciated, Fig 2B shows identical location

Re: We specify the kilometers in the phrase.

LINE 212: Tracked changes dash

Re: Done.

LINE 213/214: Word more clearly please (e.g. "...crosslines with orientations in NW-SE...")

Re: We rephrased the sentence to clarify the meaning as suggested.

LINE 215: Delete "a"

Re: Done.

LINE 219: Grammar: Change attributes to attribute

Re: Done.

LINE 220-222: Reader guidance in subchapter could be improved by suggesting that the attributes are being discussed next.

Re: We added a sentence at the end of the reader guidance stating that the attributes are discussed in the following paragraphs.

LINE 243+251+257: Use indirect speech please

Re: Done.

LINE 243-255: To improve structure of the text, please mimic structure from 233-242

Re: We relocated the sentence in this paragraph to follow the same mimetic structure as in 233-242, as you suggested.

LINE 280/281: This is not a result, please delete

Re: Done.

LINE 282: Delete "and described" – it adds no context

Re: Done.

LINE 283: Why is Fig 3A not mentioned in the text? Add please.

Re: We added the figure reference. Thank you for reminding us.

LINE 284/288/289: Capitalise letter as in all other figures to stay consistent (b to B; a to A)

Fig 3: Change vents to vent

Re: Done.

LINE 307/309/319: Use indirect speech please

Re: Done.

LINE 307: Better: Suggesting the main columnar vertical seismic facies intruding the main seismic package present deteriorated seismic signal, the primary reflections either are absent or very weak, showing edge discontinuities and attenuation of the reflectors.

Re: We rephrase as you suggested, thank you.

LINE 311: Better: Some of these structures, both along inlines and crosslines, are...

Re: We have rephrased as you suggested. Thank you.

LINE 315: Change low-permeable to low permeability

Re: Done.

LINE 317: Delete "Therefore", it doubles with instead

Re: It was deleted.

LINE 321: Change sentence order: Interestingly almost all figures show upward convex deflection of the main reflectors within all columnar areas of the disturbance zone.

Re: Done.

LINE 323: Change to ...with different degrees of...

Re: Done.

LINE 324: Grammar: Change zone to zones

Re: Done.

LINE 331: Spelling: Change disturber to disturbed

Re: Done.

LINE 331: Use indirect speech please

Re: Done.

LINE 337: Word: Change to case study

Re: Done.

LINE 337: Delete "all those", it is colloquial

Re: Done.

LINE 344: Use indirect speech please

Re: Done.

LINE 345: Grammar: Change “which are” to “a”

Re: Done.

LINE 347: Grammar: Change affecting to affect

Re: Done.

LINE 348/349: Avoid repetition of words (here: “suggest”)

Re: We change the term to 'proposes', avoiding the repetition as you suggested.

LINE 351: Use lines instead of arrows to improve figure clarity

Re: Done.

LINE 356: Better: ...increase in width to the top, crossing all formations...

Re: It was substituted.

LINE 358: Use indirect speech please

Re: Done.

LINE 359: Better: ...increase in lateral...

Re: It was substituted.

LINE 362: Use lines instead of arrows to improve figure clarity

Re: Done.

LINE 367: Where is figure 8A described?

Re: We added a phrase to describe the figure 8A.

LINE 372: Change seismic answers to seismic responses

Re: Done.

LINE 373/374: Delete “the”

Re: Done.

LINE 375: Delete “answer”

Re: Done.

LINE 375: Grammar: Change cover to covers

Re: Done.

LINE 376: Sentence structure: ...vent structures, and the dead mixed zones from the fluid pipes entirely...

Re: It was inverted following your suggestion.

LINE 377: Where is figure 9A described?

Re: We added a phrase to describe this figure.

LINE 378: “loses” - What does this mean?

Re: We rewrote the sentence to make more sense.

LINE 380: Delete “automatic”

Re: Done.

LINE 381-384: Please rewrite, this reads without spirit

Re: Done.

LINE 391: “delimited” - What does this mean?

Re: We changed the term to clarify its meaning.

LINE 391-394: Sentence structure: The vertical and lateral continuity of the pipe anomalies, cause by the seismic signal, becomes more visible with the application of...

Re: Done.

LINE 395: Show the Christmas tree, else it’s not credible

Re: We chose to delete the term.

LINE 399: Where is the Christmas tree in the figure?

Re: We deleted it.

LINE 403/405: Repetition, please find better wording

Re: We changed the term.

LINE 404: Grammar: zone connects or penetrates

Re: Done.

LINE 406: Wording: reveals a more complex geometry

Re: Done.

LINE 411: Sentence structure: (B) to end of sentence

Re: Done.

LINE 415: Spelling: wipe

Re: Done.

LINE 416: Grammar: consists

Re: Done.

LINE 417: Grammar: zones'

Re: Done.

LINE 419: Grammar: structure

Re: Done.

LINE 419: Delete "the"

Re: Done.

LINE 420: Grammar: structure

Re: Done.

LINE 421: Use indirect speech please

Re: Done.

LINE 421: Spelling: graph

Re: Done.

LINE 422: "due the comparison" - What does this mean?

Re: We rephrase the sentence for clarification.

LINE 430: Where is (C) described in the caption?

Re: Thank you for reminding us. We added the (C) at the end of the sentence.

LINE 435: Use indirect speech please

Re: Done.

LINE 440: Consistency: "V2 pipe" but "V1 graph"?

Re: We added the word 'pipe' to follow your suggestion.

LINE 442: $1.8 \times 2 = 3.6$

Re: We corrected this information.

LINE 443: Change to V1 and V2?

Re: Done.

LINE 444: Delete "to"

Re: Done.

LINE 452/457: Use indirect speech please

Re: Done.

LINE 453: Spelling: reflector

Re: Done.

LINE 463: Fig

Re: Done.

LINE 468/469: This sentence seems to make no sense like this

Re: We rephrase the sentence to make sense.

LINE 477: Grammar: vent's

Re: Done.

LINE 478-483: Rewrite: This is too vague and covers too many keywords/buzzwords at once. Currently it also states that fluid flow acts as seals.

Re: We rewrote the phrase to clarify its meaning.

LINE 480-486: Reads like a repetition of the sentence before and again is very vague. Please add more precision.

Re: We rewrote the sentence to add more precision.

LINE 485: Use indirect speech please

Re: Done.

LINE 487: Delete “the”

Re: Done.

LINE 492: Coherence: the text mentions faults; the figure mentions fractures

Re: We changed it to ‘fault zone’.

LINE 499: Change generation with development

Re: Done.

LINE 504: Better: in vent characterization

Re: Done.

LINE 505: Better: Hydrothermal vents are described by inner and outer zones...

Re: Done.

LINE 508: Better: ...allow for the characterization of fluid zones...

Re: Done.

LINE 511: Delete “the”

Re: Done.

LINE 514: Use indirect speech please

Re: Done.

LINE 516/517: Reword “but even with this, it is impossible”

Re: We rewrote the phrase as you suggested.

LINE 517: Missing verb: as?

Re: We added the missed verb.

LINE 519: It is found that the data... (this is not the conclusion!)

Re: We deleted the term ‘therefore’ and added your suggestion.

LINE 519/520: States a very obvious fact. This is hardly a suitable result.

Re: We appreciated your criticism.

LINE 522: Sentence structure: An artifact is not a geological feature.

Re: We corrected the sentence to convey the real meaning.

LINE 523/526: Use indirect speech please.

Re: Done.

LINE 532/533: “and vent complex areas as disturbed zones”? - What does this mean?

Re: We added a verb to clarify the sentence.

LINE 533/534: ...the presence of noise...and is very impacted to noise... - What does this mean?

Re: We rewrote the sentence to make sense.

LINE 538/542: Use indirect speech please

Re: Done.

LINE 539/543: Contradiction in the role of faults: fundamentally controlled vs. guide

Re: We changed the term to ‘guide’ and then removed the contradiction.

LINE 540-543: Confusing content: Which previous models? It was not aim of the manuscript to prove that vent formation is solely(?) attributed to hydraulic fracturing(?). Why “Instead?” if the above was a conclusion?

Re: You are right. Thank you for the observation. We rewrote the sentence and removed the term ‘instead’.

LINE 544: Hydraulic fracturing is not the same as fault zones

Re: We changed the sentence to clarify this concept.

LINE 544-546: “hydrocarbon migration” was not discussed in the manuscript; “reservoir permeability” was not the aim of the study;

Re: We removed the term ‘hydrocarbon migration, as it was not discussed.

LINE 552: “Interplay” does not suggest order

Re: We changed the term to clarify the sentence better.