General comments:

- Introduction assumes the reader knows the area well (see comments reviewer 2). In order to allow readers with limited knowledge on the area to understand what is being described, it would be needed to provide some context at the start, rather than directly describing the tectonic history of the area.
    - Names of tectonic features etc. need to be explained and shown on maps.
- The manuscript is short, which is nice overall, but often it is a bit too short and thus unclear (see comments)
- All figures are too small and need various adjustments(see specific comments)
- The supplement contains only 3 figures, and they are cited various times, which makes reading the manuscript a bit inconvenient. It may be better to simply add (the key parts of) these figures to the manuscript (perhaps even merged with the current manuscript figures, see also comments on figures).
- There seems to be some mixing of results and discussion. The results should present the raw observations, whereas interpretations and discussion should be provided in the discussion section.
- The order of the discussion chapter needs some adjustment.
- Timing of geological events is a big issue in this manuscript. There seems to be some circumstantial information that can help explain things, but there seems to be a lack of reliable data from the area itself (the only reliable data available seems to be the age of the sediments in the Laccadive Basin, but that does not allow us to interpret much beyond the development of the basin). As such, the interpretations and the proposed model seem rather speculative. It would be good to have additional information from wells and seismic interpretation (see comments below).

Abstract

- Line 1: “two-phase” may be better than “double”
- Line 3: perhaps use “with the Seychelles separating from India”
- Line 4: “is not discussed” seems to suggest that the topic is not discussed in this manuscript. How about “remains poorly constrained” or something similar?
- Line 6: it is not clear what the Mascarene Basin is, this should be fixed (see also comments of reviewer 2 regarding the general accessibility of the text to people who are not familiar with the region’s geology).
- Line 7: Laccadive Ridge and Tellicherry Arch have the same issue as in Line 6
- Line 8: it should be “towards the south” I believe

- Line 8: "Plate reconstruction models" → these are your new models right? So use "Our new plate reconstruction models" or perhaps "our plate reconstruction modelling" to make this very clear. (now it reads like someone else did this work). Otherwise, use "previous plate reconstruction models" or so.
- Line 10: "Paleocene traps" or "a Paleocene trap"
- Line 11: "has been attributed" suggests this is someone else's idea, not something new in this paper. It should probably be "we attribute" or so

Introduction

- In general, the introduction starts with the geological history of the area, without introducing the general (present-day) setting. This is confusing, it would be much better to have a (quick) overview of the general features of the area, before diving into the tectonic history head-first. Also, some additional maps are needed to make this part work (see also comments on Fig. 1).
    - See also comments by reviewer 2 on the accessibility of the text for those who are not that familiar with the regional geology (of SW India).
- Line 16-17: here, the text should directly refer to Fig. 1 I would say (to illustrate the geology). In fact, it seems that Fig. 1 is not at all mentioned in the introduction? You should make sure to help the reader understand the geological context as much as possible, including ample references to figures.
- Line 18: consider using "this second break-up" for clarity
- Line 19: I believe it should be "fairly well established"?
- Line 23: it should probably be "the Southern Mascarene Plateau, the Laccadive Plateau, and the Chagos Bank"
- Line 23: the Chagos Bank is not indicated on any map it seems? Same for Mascarene Plateau?
- Line 25: "is" should be "are" I believe (or use "represent"?)
- Line 28: "wide-spread trap layers"
- Line 29-31: this sentence seems a bit out of place (it seems to describe the methods used in this manuscript). Can it be removed or rephrased a bit? → or include it in the last part of the introduction, where it would be good to quickly mention the methods used in this manuscript.
- Line 33: "long-time" → remove the hyphen?
- Line 33: "m.y.r." should probably be "Myr"
- Line 35-39: these sentences /motivation for this study seems a bit random to me. It is not that clear what is meant here, as these are rather different issues that are not clearly related

to each other (sediment ages vs. the overall complext geodynamic setting). It should be rephrased a bit. Some detailed comments:

  - How would the absence of sediments fit with opening of the basin at 83 Ma (India-Madagascar break-up)? If anything, I would then expect that sediments are present, which is not the case?
    - And well CH-1-1 does in fact cross into older units? The sentence seems to suggest that the other wells were simply not deep enough to reach the relevant sedimentary layers?
  - It seems to be strange to me that it would be a surprise to have older sediments below the Paleocene traps. Is it not to be expected that there would be older units/sediments below the traps?
  - Line 36-39: this is a rather long sentence that seems to have some grammar issues, please double-check.
    - "new complexity" seems off (the complexity itself is not new, it's just that we don't/did not yet understand it I would say?) → "makes for a complex geodynamic setting" or so may work better here
    - "inheritance … before" seems off, how about "into the pre-existing lithospheric inheritance"?

- Line 36: "India-Madagascar separation"
- Line 39: use "the development of the Laccadive Basin" or something similar. The current wording seems to suggest there is a sedimentary formation called the "Laccadive Basin formation"
- Line 39-40: the same thing is stated in Line 42-44. I suggest removing it here to avoid duplication.
- Line 40: what kind of "evidence"? → see previous comment on mentioning the methods used in this manuscript. That way the reader can better appreciate where things are going.
- Line 42: "Understanding" seems a bit vague → what exactly needs to be understood?
- Line 43: "will provide" suggests this needs to be done in the future, but the start of the sentence seems to suggest it is already known. Please make very clear which of the two it is (e.g., use "future studying and time-stamping" or "event provides important constraints", respectively).
- Line 44: use "plate tectonic reconstruction studies" to make it clear what is reconstructed.

Description of tectonic elements

- Line 45: add "of the study area" to make it clear we are not talking about the region as a whole.

    - NB: several terms are used in this manuscript ("study area", "area under investigation", "area of interest"). I suggest choosing one and using it consistently throughout the manuscript.

- Again, make sure to refer to Fig. 1 early on
- See comments on Fig. 1 on the need for more maps
- Line 46-47: as it is written, it is not fully clear whether only the southern part of the Laccadive Basin is included → consider swapping the place of the ridge and the basin in this sentence. Also "in the offshore" seems incomplete?
- Line 49-50: the CKE is not indicated in Fig. 1 it seems? Please add all structures/locations mentioned in the text to relevant figures.
- Line 50-51: this is the first clear definition of the Laccadive Basin, 50 lines into the text. As this basin is in the title, it should be introduced very early on (in the first couple of lines).
    - Ah, I now see that there is also a definition in line 25. Still, please consider the previous comments on "setting the stage" in the first sentences of the text.
- It seems that the CRS is not mentioned, even though it's a very important feature (for instance, it's the first topic of the discussion)? Please add some description here to prepare the reader.

Data and Methods

- Line 55-59: somehow the text is not that clear here: it is stated twice that seismic lines are used, apparently for the same purpose (?).
- Line 56: why not use the more recent 2023 GEBCO bathymetry data?
- Line 56: "the long-offset" → I believe that "the" should be deleted there. This goes for a number of places in the text, where "the" seems to indicate a very specific thing that is not really specified before in the text, and therefore seems a bit off. I hope this makes sense.
- Line 57: "provided" is a bit unclear, it seems to suggest that these data were simply taken from Unnikrishnan et al. 2023). These data cover the whole study area? It may be good to show the extent of the different datasets (in the supplement would be ok).
- Line 58: what are "intermediate" horizons? Please clarify in the text. (e.g. "and various horizons within the post-Paleocene sediments").
- Line 58: what is meant by "compiled"? Did you produce these sections yourself, or did you interpret them? Please rephrase to clarify.
- Line 62-63: a citation would be in order at the end of this sentence, or at the end of the previous one.
    - Line 62: I suggest using "these two-way travel time (TWT) maps

    - Note that TWT should be defined in line 61, as that is the first occurrence of the abbreviation.

- Line 65: add “, respectively” after “column”.
- Line 68: only one seismic section, or multiple?
- Line 68: what is meant with “transferred”? you mean “identified on the gravity anomaly maps” I assume? Please rephrase.
- Line 84-85: the coast-parallel grabens are not shown? It may be better to just state that sedimentation is high along the coast.

Results

- Line 72-74: why are these extension directions interpreted as such? It seems that these en echelon graben arrangements may in fact indicate oblique kinematics, rather than orthogonal stretching. For example, the NNW-SSE oriented grabens could indicate ca. NNE-SSW extension. As such, you should be very careful with these statements here. In fact, this all goes into interpretation/discussion domain, and should be addresses in the discussion. The results are the place where the “clean” observations are presented.
- Line 77: how parallel to the extensional trend (or trends?) is this volcanic intrusive really? That is, what is the orientation of the extensional trend (not clearly defined)? Is it one “intrusive” or can we speak of a series of intrusive structures/bodies? Please rephrase where needed.
- Line 81-82: please annotate this channel in the figure, it’s not that clear what is meant
- Line 83: the sedimentation is significant in the northern part of the Laccadive Basin, not overall. Please rephrase the text to better reflect this.

Discussions

- Line 88: I would use “Discussion”
- Line 89: see previous comment: what is the CRS? This needs to be clearly defined early on in the manuscript, as it seems to be very important
- Line 90-91: similar to the introduction, the reader is expected to remember everything about the local (and regional) geology, and we directly dive into the geological history, rather than starting with the data and their implications to gradually build up to a regional picture. As a whole, section 5.1 seems out of place here → the discussion needs some reconstruction as to provide a logical story to present to the reader.
- Line 90-91: how do these data show that the development of the Laccavide Ridge occured after, and not during, India-Madagascar break-up?
- Line 91: what mainland is meant? India or Madagascar? Please indicate

- Line 91: how do we know it is passive extension? This needs to be explained
- Line 91-93: see previous comment on the interpretation of the extension directions as interpreted in this manuscript. Note also, that according to this interpretation, the southern part of the Laccadive basin would have seen yet another extension direction, given the orientation of the grabens. This is all too simplistic and needs more careful consideration.
    - Could it be that these basins are in fact of different age? See previous comment on the lack of interpreted horizons in the sections.
- Line 94: see comments on the use of/references to supplement data in the main text: this seems important data that should not be hidden in the supplement.
- Line 96-97: how do we know the age of the CRS?
- Line 97-100: how is the CRS defined? There are extensional structures further south, could these not simply be part of the CRS? Having some age constraints from seismic data could help here.
    - Regarding the different orientation of the grabens: an explanation could be that there was some inherited structural grain that got reactivated, forcing the development of these grabens in a different orientation than that what one would expect.
- Line 104: why suddenly use Mangalure and not the Tellicherry Arch as an indication here? (and why refer to Fig. 1, which is not relevant here?)
- Line 110-112: there is no beta-factor analysis provided? Please add this.
- Line 119-120: It is not clear what the median high is, and how it indicates opening of the basin after the Eocene (as the text seems to suggest now).
- Line 120: I would state “after the early Eocene” as it is not excluded that significant sedimentation (and thus basin development) initiated in the mid- or late Eocene.
- Line 122-123: would not the initial “patch” indicate the start of basin development?
- Line 126: what is meant with “by this time”? there is no clear or logical indication in the previous sentences to use this wording, please specify
- Line 126-128: it is not clear to me what information in this study justifies the correlation with the proposition of Unnikrishnan et al. (2018) that the Allepy Platform was formed during the Oligocene-Miocene. (what is meant by “formed”?) There is not seismic section provided that covers this platform, and I believe it is not even really addressed in the results? Please clarify in the text what is meant.
- Line 130: see previous comments on names of geological units/structures. Nowhere it is clear what the Mascarene Basin is.
- Line 130-145: the evolution proposed in this section seems nice, but also highly speculative as very little clear evidence is presented (either from the analysis in this paper, or from previous works). Various tectonic and geodynamic events are mentioned, which are not properly set up in the introduction. This all needs some work to make it more convincing.

Note also that most references are rather old, I assume there must be some newer works with the latest insights that could be used here.

- Line 130: in fact, it is not merely “near” but directly adjacent to the Mascarene Basin I believe? (the Mascarene Basin being the basin developing between India and Madagascar, if I understand it correctly)

- Line 134-140: see previous comments on the orientation of the grabens in the study area. It may be interesting to have a look at analogue and numerical modelling works that test the impact of inheritance during rifting. You can for instance have a look at the works by Henza et al., Molnar et al., Bonini et al., and Zwaan et al.

- Line 143-144: This seems a bit of a bold statement: what is the evidence for this? It should probably be toned down a bit.

- Line 145: is there any description of the age of the volcanics vs. the sediments in the basin? This would be an important observation from seismic sections to be included in the results (which it is not at the moment)

Conclusion

- Line 154: it should at least be specified what plume is meant here.

Figure 1

- This figure is much too small (especially the tectonic reconstruction), and the text is really not readable in large parts of both panels. Note also the varying font sizes → I strongly recommend standardizing font sizes.

- There is no ocean depth/topography scale it seems? Please add. (also in the supplement)

- It would be much better to include a general map (panel A from Fig. S1) to help the reader understand the various tectonic elements that are mentioned in the text, but not shown (e.g., Madagascar, Seychelles). Furthermore, It would be good to have a zoom-in map of the study area as well, to clearly show the tectonic elements described in section (2) of the text.

- Note that although the Laccadive Basin is in the title of the manuscript, there is no obvious indication of where it is situated. Instead, the left panel shows in large bold letters the Laccadive Ridge and Maldives.

- The left panel indicates the Laxmi Ridge (and SVP + DVP) as polygons, whereas elements such as the Laccadive Ridge and Maldives are not. This seems inconsistent. It would in fact be much better to show a simplified geological map (the general map from Fig. S1 could serve as a general introduction instead).

    - One thing that should probably be added: the Continent-Ocean transition, unless the Laccadive Basin is a (hyperextended) rift basin (this is not very clear)

- In the right panel, the area of interest is indicated with a red rectangle. This rectangle is however poorly visible (at least to me, I got slight red-green colorblindness). I would suggest using a black outline for the AOI, and using less thick greyish outlines for the continents.
    - Similarly the thick continental outlines drown out the break-up information.
- There are white and green lines used in the left panel. These are not very clearly distinguishable. Perhaps making the map larger would help, but also consider
- What is the definition of the Vengurla and Tellicherry Archs? I believe this is not really specified anywhere? Please clarify in the text.

Figure 2

- Also this figure is too small (including the text/annotation) and should be presented much larger. It may also be possible to rearrange the panels to allow for things to be made larger (i.e., move some of the sections below the map?)
- The color scale used in the map is a rainbow scale, which should be avoided (see the work by Fabio Crameri on the use of color in scientific publications). Moreover, the scale has no clear zero value color: a scale that has both positive and negative values should have a clear zero-value color to avoid artifacts and apparent structures.
- I see in this figure that there is an additional zoom-in to the study area. This becomes rather confusing, as there are now two zoom-ins (study areas?) of the general area shown in Fig. 1. It would be good to only use one extent to present the model results for consistency. It is now rather difficult to for instance compare the structures shown in Fig. 2 with those shown in Fig. 3 → are the lows in fact tracing the interpreted grabens? It
    - Also, there should be an indication in the caption that the location of this map is shown in Fig. 1.
- The sections miss an indication that the seconds are in TWT. At the least, this should be indicated in the caption (including a definition of TWT).
- Using circles to indicate circles is a bit confusing → one may mistake it for a zoom-in. It would probably better to just use an arrow, or perhaps a dotted circle instead.
- The white arrow indicating the Tellicherry Arch is poorly visible. Consider using another color. (same for other figures)
- Caption: what does “CRS represents the Cannanore Rift System as identified by DGH” mean? What is “DGH” an abbreviation of? Please specify.
- Note that the “broken brown line” is very poorly visible in the map. Please improve this.
    - Note that the line is in fact not broken (?)
- The horizontal scale of BB’ and CC’ is different from those in the other sections (which appear to also represent variable lengths in map view. It may look esthetically pleasing to

have these sections in the figure all at the same size, but it does not properly represent the natural situation and the relations between these sections. Please rescale things.

    - This is also relevant to Fig. S2

- Seismic line labeling: why are some of these lines labels with numbers, and other with letters? Please standardize things.

- Overall, only faults are interpreted in these seismic sections. Is there no data whatsoever about ages etc.? There is a mention of various boreholes in the area, so I would think this could be added? → like is done for sections 1-3 in the supplement.

    - Note that there is various annotation in sections 1-3 that is not explained anywhere (no legend)

- Wy are the grabens in the Trivandrum Terrace area indicated in white? They are barely visible. Please use the same color as used to the west.

    - Same for the NW corner of the map

- Upon closer inspection of the seismic sections: it seems that there are many faults that were not interpreted. Why not? In fact, I realized that the Laccadive Basin is the study area, but there is not one section that clearly shows the general characteristics of the basin (it is a rifted basin right?) → I would suggest having a look at (the figures of) Gireesh & Pandey (2014) → Open Access link: https://www.researchgate.net/publication/260213497

Figure 3

- Panel (E) is described as a tectonic map in the caption, which it is not really? (panel F seems to be?)

    - Note that panel F is not a map of beta-values, as described in the caption

    - Overall, panels (E) and (F) seem to represent general interpretations, rather than results, and should as such be made into separate discussion figures.

- See comments on the use of scientific color (scales) in Fig. 2. These are also relevant here; the color scales in Fig. 3 seem inappropriate.

    - Color scale units are not always aligned in the same way (compare panel A with the other panels.

- The lows are indicated using red lines. These lines are poorly visible: please use another indication (e.g., black dotted lines).

    - The same for the CKE in green.

- Caption: the abbreviations of TA and TT are nor provided, please add these

- Caption: the repeated “with all identifications” is a bit vague. Consider using “with all identified/interpreted structures”

- In panels B-F, but not in A, there are additional lines in the SE. What do these represent (it is not clear what “shelfal tectonic elements” are, and why ther are not indicated in panel A)?

Figure 4

- Somehow the study area has a different extent than that in Fig. 3? Please standardize the study area extent in your maps for consistency.
- See previous comments on the use of colors. This needs to be improved here.
    - It would be best to use the same scale for panels A-C, to allow for easy comparison between the different time intervals
- I suggest using a broken line or something less dominant to indicate the sediment patch in panels A and B.

Figure 5

- This figure needs to be larger to better show the details
- Stage III covers no less than 40 Myr, but seems to show a snapshot of the initial Laccadive Basin opening (around 60 Myr?). I strongly suggest avoiding having such time ranges in these panels, as it is confusing.
- Stage IV: I would simply remove Madagascar to avoid confusion. The way it is now shown, it seems to suggest India and Madagascar are pretty close to each other, with the black line representing a mid-oceanic ridge.
- It would be useful to add some annotation highlighting the important events in the system.
    - Note the timing of the various events: how do we know the age of the rifting that is attributed to stage II? This is not really specified/justified in the text?
    - See also the comment on the last part of the discussion: it would be good to
- I suggest moving the text “Stage-I” etc. in each panel to the bottom-right corner (it seems poorly aligned at the moment.
    - Also, the header of the Stage-I panel seems not properly aligned
- Caption: please provide the meaning of ATTC and CKE (each abbreviation in a caption/figure needs to be explained in the caption [of that figure]).