

Dear authors,

Many thanks for submitting a revised version of the manuscript.

I have done a thorough revision, and although this revised version has improved a lot (both text and figures), there are a number of issues that need attention. Please see the uploaded document for more details.

Looking forward to receiving your revised manuscript.

Kind regards,

Frank Zwaan

General comments:

- The manuscript is still very short. This can be fine, but it means that things need to be very clear in a very short text. However, in the current manuscript, it seems that important information is missing and descriptions are not always easy to follow. The authors have provided extensive details in their replies, and these details should be available to the reader in some form, if not in the main text, then in the supplement.
- The results section is really too short (17 lines only), followed by a multi-page discussion. This is a bit of a problem. Moreover, the authors should present their results in a logical order (see also below) and avoid presenting new details in the discussion (e.g. detailed description of the distribution of sediments → all information derived from analysis done in this study and that is touched upon in the discussion needs to be clearly laid out in the results section).
 - When reading the methods, it seems that the sedimentary thickness maps are key to prepare the gravity analysis. So, when reading the current text, I would expect the following order of presentation (each with their own sub-section in the results):
 - Sedimentary thickness maps
 - Newly derived Bouguer anomaly maps → revealing key structures
 - Seismic sections → providing more detail on these key structures.
 - Other orders of presentation could also work, e.g. first the seismic sections, then the sedimentary thickness map, then the Bouguer anomaly. Perhaps even the current one could be fine. But the order of things needs to be consistent in both the methods and results to make things easy to follow for the reader, and to set things up for the discussion, where the results are interpreted and combined with current knowledge to develop the tectonic history of the study area.
- The reasons for interpreting one series of grabens being older than the other are not very clearly explained. From geometries and basin distribution alone, this distinction cannot be easily made. The authors should make it very clear what the reasons for their interpretations are. N
 - There are some reasons given here and there, but they are somewhat hidden in the text that seems to already assume that the case is clear. Instead, these reasons need to be highlighted.
- The way the figures are presented is a bit confusing.
 - Firstly, results Fig. 3 and 4 are shown before the results section. This is not a major issue, but needs to be corrected at some point (at the latest in the published paper, if the manuscript is accepted)
 - There is still some ambiguity regarding the study area. There is an “area of interest” shown in Fig. 1b, but a smaller “study area” in later figures. Even so, the authors present seismic sections that are taken from outside the study area (G-G’ and H-H’). This needs some fixing. A simple solution would be to state that the “study area” is simply as large as the “area of interest” (in other words, they are the same). The maps in Figs. 5-7 could be made a little larger to accommodate for this I would say. This way, there will be no ambiguity about the extent of the study.
- Some sentences have some grammar issues or are not very clear, I tried to point them out and propose solutions

Specific comments:

Line 4: it may be better to use “situated” instead of “lying”

Line 7: “extensional directions” seems a bit confusing, I assume you mean “trends of extensional structures”? This needs some rephrasing

Line 10: “associate” is used twice in this line, perhaps the last occurrence could be “linked”?

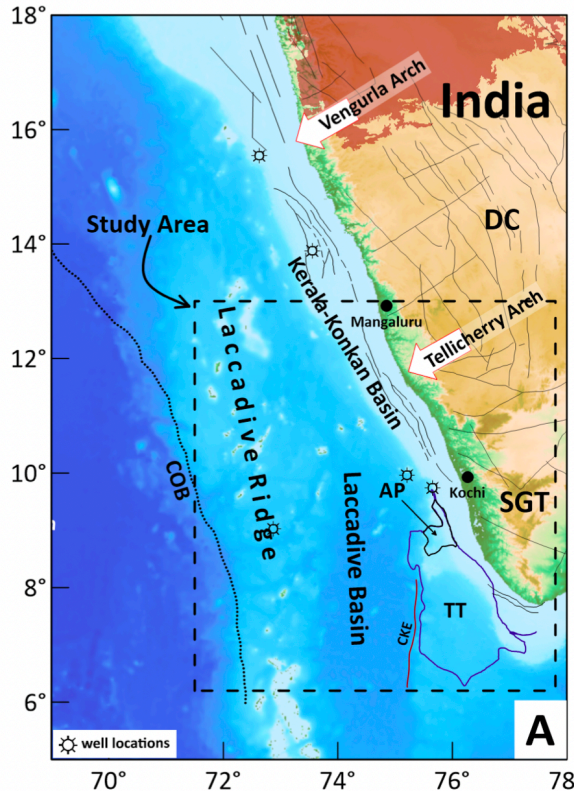
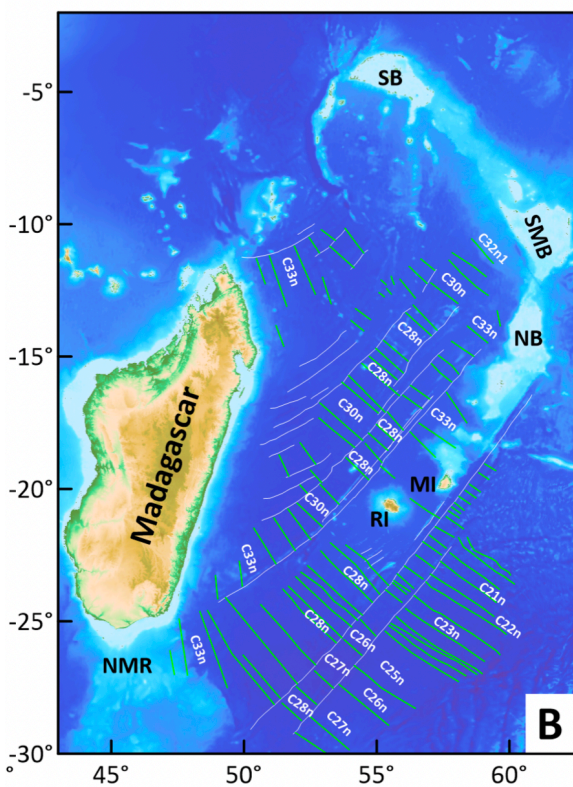
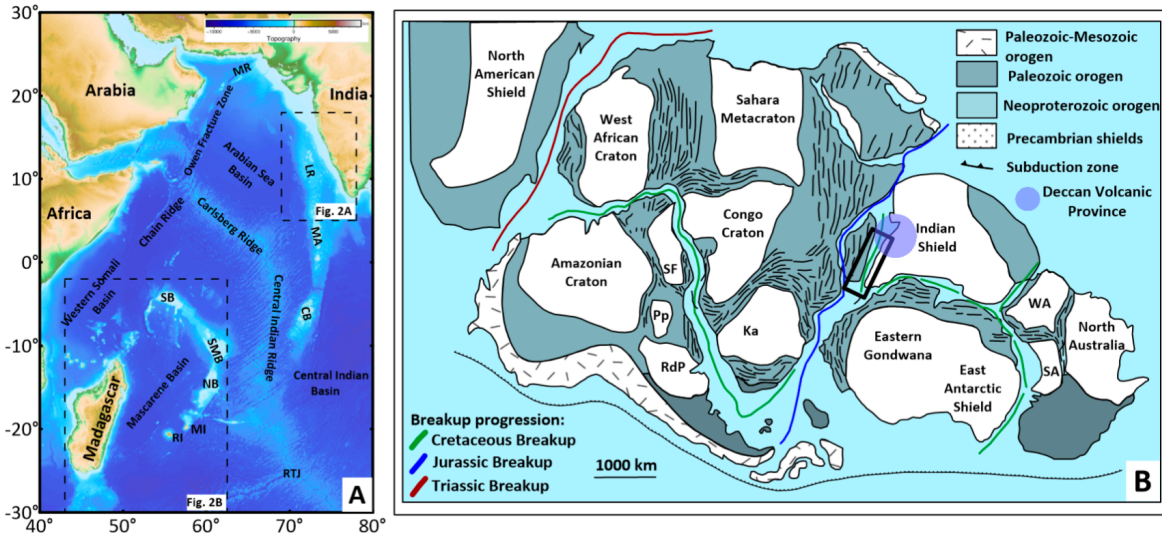
Line 11: grabens are by definition extensional features, hence “extensional” should be removed here

Line 18: it should be something like “culminated into the development of the present northwest Indian Ocean” I would say.

Line 18-20: I believe the abbreviations introduced here are not used later in the text? As such, they can be removed here.

Fig. 1: this is very nice figure now. Some comments

- In panel A, the altitude scale is too small (text is not readily readable).
- In panel B, there are numerous abbreviations for the various plates/cratons, which should be specified in the caption
- In Panel B, I would recommend using a bright red dot, instead of a blue dot to indicate the Deccan Volcanic Province
- It may be useful to merge figures 1 and 2 (by simply putting the two panels of Fig. 2 below those of Fig. 1).
 - see what it may look like on next page
 - Caption text can be merged, saving space.
 - Font size may have to be adjusted in the panels derived from Fig. 2
 - See comment on the order of the panels in Fig. 2



Line 29: it should be "with the eastern Madagascar margin"

Line 29: "based on the matching of the major shear zones and reconstructed to 30 m isobath" seems to be missing some words in the latter part of the sentence. Please rephrase

Line 30-33: “However, recent close-fit reconstruction models have incorporated the continental fragments like Laccadive Ridge (Bhattacharya and Yatheesh, 2015) or Mauritia, comprising of Mauritius, the Southern Mascarene Plateau, the Laccadive Plateau and the Chagos Bank (Torsvik et al., 2013) between India and Madagascar in the India-Madagascar pre-drift scenario, and suggest a breakup timing of around 83 Ma.” → it could be better to use:

- “However, recent close-fit reconstruction models have incorporated the continental fragments like **the** Laccadive Ridge (Bhattacharya and Yatheesh, 2015) or Mauritia (comprising of Mauritius, the Southern Mascarene Plateau, the Laccadive Plateau and the Chagos Bank between India and Madagascar in the India-Madagascar pre-drift scenario, Torsvik et al., 2013), and suggest a breakup timing of around 83 Ma.
 - Here the extent of Mauritia is more clearly defined.

Line 34: “Laccadive Ridge (Plateau)” is confusing, as this suggests there are two names (for the same structure?). Please stick to one name and use it consistently through the text. Please also add “The” at the start of this sentence

Line 35: add a figure reference directly after “India”

Line 36: it may have to be “it is well-known” that”

Line 36: the SW margin of what? Please specify in the text.

Line 36: it should be “the end of the Cretaceous”

Fig. 2. Some comments:

- See idea of merging Fig. 2 with Fig. 1
- Consider swapping panels A and B to respect the geographical arrangement shown in Fig. 1a (Madagascar lies to the west of India, so it would only be natural to have Madagascar in Panel A and India in Panel B)
- Panel A: consider filling the well location symbols with a white center to make them stand out
 - Is one of these the CH-1-1 well that is mentioned in the text? Please indicate it (if possible, indicate the names of all wells shown in the figure please)
- Panel B: the green on blue lines are poorly visible. Please try black for (old) transform faults and white for the magnetic anomalies
 - Note that it is not very clear which anomaly is which (the annotation indicating the name of the anomalies is not clearly linked to specific anomalies it seems)
- The topography scale is too large, please reduce it a bit in size
- If Fig. 2 will not be merged with Fig. 1, the caption should contain a mention that the location of these maps is shown in Fig 1a.

Line 37: “of wide-spread trap layers” or “of a wide-spread trap layer”

Line 38: please specify to whom the vintage data was not of much help (it now reads a bit as this was not helpful in this manuscript, which is not the case I believe)

Fig. 3. Very nice figure. Some comments:

- Please specify in the caption that panel A shows gravity data, this is not clear
- In both panels: the reddish arrow indicating the Tellicherry Arch is poorly visible. An easy and effective solution is to add a black outline to the arrow to make it stand out.
 - This issue also occurs in various other figures
- The broken red line is very poorly visible in both panels → please use another color (e.g. black)
- The caption should contain a mention that the location of these maps is shown in Fig 1a.

Line 40: see comment on wells in Fig 2 (where is this key well located? Please indicate on a map).

Line 41-43: “One of the key question that was not resolved is the absence of Late Cretaceous sediments in the Laccadive basin as a whole and the long time gap of more than 20 Ma between the India-Madagascar breakup at 83 Ma and the oldest sediments of Paleocene age.”

- This sentence is not very clear. I believe it should be something like:
 - “One of the key questions that have not been resolved concerns the absence of Late Cretaceous sediments in the Laccadive basin as a whole: what caused this more than 20 Myr gap in the sedimentary record between India-Madagascar breakup at 83 Ma and the oldest Paleogene sediments?”

Line 45-46: it should be something like “makes **for** a complex geodynamic setting, **considering** how this separation took place, and therefore provides some insights into the **impact of** pre-existing lithospheric inheritance.”

- It was not very clear why inheritance is mentioned.

Fig 4: very nice figure, some comments:

- The dotted circles help to show the interpreted intrusions. However, would it be possible to draw in the actual intrusions themselves? Now the reader still needs to identify these intrusions. I think some transparent grey could work well (?)
- Note that the map indicating the locations of the sections has the same issues as Fig. 3a

Line 48: “margin” → perhaps use “Western Continental Margin of India” or WCMI to remind the reader (make it very clear)

Line 48: consider starting a new paragraph at “In this study ...” to emphasize that the goal of the current manuscript is being introduced.

Line 49: it should be “at the southwestern part of the margin” to avoid confusion (we are still talking about the WCMI here, not another margin)

Line 51: use “improved **plate** tectonic reconstruction models”

Line 55: the ATTC is never used in the figures (?) → instead “TT” and “AP” is shown → please use a consistent name (I would suggest Trivandrum Terrace/TT (shorter and easier).

- After consideration, perhaps just remove the abbreviation “ATTC” from the main text. Including an abbreviation suggests it is a very important term/feature, which it does not seem to be later in the text (?)

Line 59: “to this” could be removed

Line 61: it may be better to use “DGH 2024” to make it clear this is a citation that can be found in the reference list (now it is only an abbreviation).

Line 63: it should probably be “from the General ...”

Line 63-64: these data are shown in Fig. 3 I believe? A reference to this figure would be needed.

Line 64-66: it is not clear whether a new seismic analysis is performed, or whether the authors simply adopted the data from Unnikrishnan et al. (2023). This needs to be made very clear. If the authors did a new analysis, they should explain how the analysis was done (in the main manuscript, or otherwise in the Supplement).

Line 66: double “and” → please remove

Line 74: it should be “for the water column are used, respectively” I believe

Fig. 5: Very nice figure, but same issues as Fig. 3a:

- “Tellicherry arrow” needs a black outline
- The brown, green and blue colors used to indicate the lows, CKE and volcanic ridge are often poorly visible. Please use black instead
- Please check the alignment of the color scale and annotation, it seems like there is some overlap with other elements of the figure

Line 83-85: it can be rephrased: “We correlated these structures with the gravity anomaly trends and noticed that the grabens are oriented NNW-SSE in the area north of the Tellicherry Arch, whereas the grabens are oriented NNE-SSW south of Tellicherry Arch.”

Line 85-86: it should be “anomalies, the continuity of which”

Line 91: it should be “with much less sedimentation” I believe (or “with limited sedimentation”)

Line 94: “is” should be “was”

Line 96: it should be “to recent times” and “sedimentation has been uniform”

Fig. 6: some comments:

- See previous comments on the “Tellicherry arrows”
- Is this a new results map, or rather a

Line 101-103: very important to get this right, as this is a key point. The text should be something like “This study identifies two major extensional events in the southern part of WCMI, **the first being recorded by** the NNW-SSE oriented grabens over the Laccadive Ridge north of Tellicherry Arch, **and the second by the** NNE-SSW graben system in the Laccadive Basin area south of Tellicherry Arch (fig. 3).

- It is (still) not very clear from the text why the NNW-SSE grabens should be the older structures.

Line 104 and 105: see previous comment on DGH citation

Line 105: the acronym for the directorate is already specified earlier in the text, so why not just use “DGH here”?

Line 104-105: the citation of Zwaan et al. 2021 may be misleading, they did not work on this study area.

- The authors need to indicate the Dharwar structure on a map (it is not clear what this trend is, and where it can be found)
- If they intend to cite the Zwaan et al. study, they need to specify that (and why) the structures in the present study area can be compared with the analogue modelling results by Zwaan et al. (2021).

Line 105-109: the identification of the CRS seems to be a result, and should be included in the results section, before it is introduced in the discussion. (it needs to be clear what the new results are, and what is interpretation and discussion).

Line 112-114: It is not fully clear to me how this conclusion can be drawn. What is the evidence for the age of these grabens? Is there some previous work that provides age constraints? After all, all extensional structures shown (both north and south of the Tellicherry Arch, but also on the Trivandrum Terrace could form in a roughly E-W extensional system). This needs some clarification in the text.

Line 114-119: I do not follow what is meant here. What trend is expected to continue southward? What is different? I assume the orientations of the grabens? Even so, the text needs some clarification.

Fig. 7: some comments:

- Panel A: See comments on color use in for instance Fig. 3a.
- The seismic section should have its own labeling (D)

- Caption: please specify what “LB” stands for

Line 156: please add a reference to Fig. 8 here.

Line 159-161: what is meant with a large number of sutures? Sutures are major boundaries between tectonic plates, so there should generally be a single one. Perhaps the authors mean inherited structures or so? Please rephrase.

Fig. 8: some comments:

- Please make sure to use the same font in all panels (the “Stage” indications are in Times New Roman, the rest in Arial it seems).
- It would be good to add arrows indicating the direction of plate motion in each panel (not 100% clear at the moment)
- Please make sure to (re)align the annotation, it should probably be a bit smaller and perhaps not bold. NB: headers seem fine
- Consider removing (at least) the outer box, as it distracts from the actual figure.
- Stage II: “spreading” is misspelled

Line 164-165: it would be better to put the Peron-Pinvidic etc. references at the end of this sentence, and to specify that these are more general studies/studies focusing on other areas (which could still be used for interpretation here).

Line 168: see previous comment on the Dharwarian trend → it is not made clear what this is

Line 170: what spreading center? I assume the one in the Mascarene basin? Please specify

Line 170-171: where was it stated that the lithosphere was weak? Please check.

Line 174-176: in fact, this seems to not be show in section 5.1 (?) please rework

Line 176-178: what is meant here? That magma from the Réunion (hotspot) magma intruded into transform faults? Please clarify in the text.

Line 176: the Réunion hotspot?

Line 178: what are “similar arguments”? → please specify in the text