

Reply to Major Comments:

Comment: - there is a description of present-day structural orientations and extension directions. However, it is clear that these may not represent the situation in the past, as plates have moved around (this is very clear from their own summary Fig. 7). As such, one should refrain from stating things like a E-W extension during the opening of the Mascarene basin, that is indicated by the magnetic anomalies, as the situation was different.

Reply: We thank the reviewer for asking this. We believe there is some confusion regarding the comment. First of all, the plate-tectonic reconstruction study carried out by Shuhail et al., 2018 and Bhattacharya and Yatheesh 2015 are based on a fixed Madagascar frame and it is the convention to describe the features based on present-day structural orientations. Secondly, the magnetic anomalies in the Mascarene Basin is well preserved. Moreover, when we analyze the plate movements from reconstruction we observe clearly that the Madagascar and India separation took place E-W initially. Hence, we stated that E-W extension during India-Madagascar separation.

Comment: - there is now an argumentation for a change in extensional regime, but it is not really clear how this works. The current text mentions transform faults, but how would such a transform fault change the (local) extension direction I don't see. If anything, the arrangement of spreading centres as shown in stage II of Fig. 7 would imply that extension is roughly SW-NE, so the proposed second-phase grabens are oriented in the wrong direction? Or is the idea that these grabens follow the orientation of the transform faults? if so, this should be made clearer (even so, one would expect the same thing to happen to the north as well). Overall, the evidence provided for stage II is not sufficiently convincing as is (in fact, the text at the start of the discussion seems to imply that both graben orientations in the area developed at the same time), and the mechanism that would cause the development of a later set of grabens with a different orientation remains unclear.

Reply: We thank the reviewer for pointing out this. Yes, the idea is that the grabens follow the orientation of the transform faults. We agree there is some lack of clarity in the text. We have now rewritten the second paragraph of discussion to clarify this. Also, please see the reply to line by line comments.

Reply to line by line comments in the text:

Comment: write: "India and Madagascar that created the Mascarene Basin in the Late Cretaceous". (otherwise it is not very clear what the Mascarene Basin, which is mentioned later on, really is). **[line 2]**

Reply: The suggestion is incorporated in the MS.

Comment: write: "a NNW-SSE oriented structure over the Laccadive Ridge north of Tellicherry Arch, interpreted to result from ENE-WSW extension, and a SSW-NNE oriented structure in the

Laccadive Basin region towards the south, interpreted to result from NW-SE extension." Otherwise, the text does not make much sense [line 7-8]

Reply: We thank the editor for pointing this out. The suggestion is incorporated in the MS.

Comment: write: "Paleocene trap volcanics" to make clear we are talking about volcanics. [line 10]

Reply: The suggestion is incorporated in the MS.

Comments: (fig.1 caption)

- please check the ages of break-up in this map and this citation, as they seem to be incorrect. As far as I am aware, break-up in the North Atlantic did not occur prior to Jurassic, but here it is indicated as Triassic?
- write: "Map showing"
- write: "of the maps in panels C and D are shown in panel A"

Reply: We thank the reviewer for pointing out this mistake. We have now corrected this in figure and checked for the correctness of other times. The other suggestions are incorporated as per the comment.

Comment: please indicate the Laxmi Ridge on one of the maps, --> it is now missing and therefore unclear /confusing [line 25]

Reply: We have now indicated Laxmi Ridge in fig 1A.

Comment: 2 times "matching" --> consider using a synonym? [line 29]

Reply: The suggestion is incorporated in the MS. The sentence is modified as "The southern part of the margin is considered to be conjugate with the eastern Madagascar margin (Katz and Premoli, 1979) based on the continuity of the major shear zones and coastlines matched at 1000 m isobath."

Comment: move figure reference to end of sentence for clarity [line 35]

Reply: The suggestion is incorporated in the MS.

Comment: write "a wide-spread layer of trap volcanics" [line 36-37]

Reply: The suggestion is incorporated in the MS.

Comment: start the sentence with "By contrast, the" [line 40]

Reply: The suggestion is incorporated in the MS.

Comment: add reference to Fig. 1D here [line 40]

Reply: The suggestion is incorporated in the MS.

Comment: use "felsic volcanics"? NB: this is basement, right? if so, write: "felsic volcanics that are attributed to the basement" or simply "felsic volcanics of the basement" **[line 41]**

Reply: These volcanics are assumed to be Late Cretaceous in age and acidic (> 65 % of SiO₂) in chemical composition (Singh and Lal, 1993; Rathore et al., 2015). The basement in this region is supposed to be Dharwarian supergroup rocks (Archean) which is yet to be established by drilling. The CH-1-1 well was terminated in acidic volcanics which are correlated with Late Cretaceous volcanism of St. Mary's Island (Pande et al., 2001).

Comment: PROBLEM? **[line 44-45]**

Reply: The purpose of the statement is to imply that we are trying to address this issue and the opening of the Laccadive Basin. Our model of opening of Laccadive Basin can help to address this issue.

Comment: remove hyphen **[line 44]**

Reply: The suggestion is incorporated in the MS.

Comment: replace with "presence" (makes more sense in this context) **[line 45]**

Reply: The suggestion is incorporated in the MS.

Comment: write "WCMI" **[line 49]**

Reply: The suggestion is incorporated in the MS.

Comment: put between parentheses **[line 57]**

Reply: The suggestion is incorporated in the MS.

Comment: this should be "Fig. 2A" **[line 66]**

Reply: The suggestion is incorporated in the MS.

Comment: please use "Figs. 2b-5" to avoid citing later figures earlier than early figures (in this case, Fig. 5 is cited before Figs. 3 and 4). **[line 68]**

Reply: The suggestion is incorporated in the MS.

Comment: write: "to obtain" **[line 72]**

Reply: The suggestion is incorporated in the MS.

Comment: detail: Solid Earth will likely convert this in kg/m³ --> you could already do so yourself **[line 76-77]**

Reply: The suggestion is incorporated in the MS.

Comment: add the source of the gravity data (Sandwell et al. 2014) **[fig.2 caption]**

Reply: We thank the reviewer for the comment. The suggestion is incorporated in the MS.

Comment: this is not really a new result? (the data are simply taken from Unnikrishnan et al. 2023). To avoid confusion, please use the following title: "Sediment Isochron map analysis" that way, it's clearer that this is not really a new map per sé (what seems to be implied with the current title), but that a new analysis is done with it. **[line 86]**

Reply: The suggestion is incorporated in the MS.

Comment: write "below" **[line 92]**

Reply: The suggestion is incorporated in the MS.

Comment: write: "From Early Miocene to recent times, sedimentation" **[line 93]**

Reply: The suggestion is incorporated in the MS.

Comment: make it very clear that this is directly based on the data from Unnikrishnan et al 2023. Omission of this fact is not acceptable here. **[fig. 3 Caption]**

Reply: The suggestion is incorporated in the MS.

Comment: similar to the previous section, it would be good to imply that something new is done --> replace "map" with "mapping"? **[line 97]**

Reply: The suggestion is incorporated in the MS.

Comment: write: "reveal" **[line 98]**

Reply: The suggestion is incorporated in the MS.

Comment: refer to Fig. 2B **[line 99]**

Reply: The suggestion is incorporated in the MS.

Comment: write: "structural trends" **[line 113]**

Reply: The suggestion is incorporated in the MS.

Comment: move figure reference to end of sentence **[line 116]**

Reply: The suggestion is incorporated in the MS.

Comment:

this is what the current-day situation shows, but was this also the case in the past (the plates may have moved over time, so these spreading directions may in fact not be correct for the past situation?) **[line 121]**

see comments on the validity of plate motion directions presented in this manuscript **[line 130]**

Reply: We thank the reviewer for asking these. This is a convention that is followed when plate-tectonic reconstruction studies are carried out. The directions are mentioned based on the present-day configuration. Moreover, the reconstruction study indicates the sense of movement which matches with the conclusions drawn correctly.

Comment: see general comment: lines 125-131 do not develop a convincing argument yet. Please rework this and make things clearer. A reference to a figure would be of great help as well, otherwise it is not very clear what the tectonic setting is, that the authors invoke. Fig. 7 seems to be the obvious figure to refer to here. **[line 125]**

Reply: We thank the editor for pointing out this. We have now rewritten the part for more clarity.

Comment: write: "reconstructions" (plural), or "reconstruction efforts" **[line 128]**

Reply: The suggestion is incorporated in the MS.

Comment: not clear how this connection is made. Also, transform faults are in principle only active between the two spreading ridges they connect, so I don't see how they can affect grabens far away on the margin of India? **[line 129]**

Reply: We agree with the reviewer that transform faults are in principle only active between two spreading ridges. The southern part of the Mascarene Basin was characterized by large transform faults and the spreading was very active here compared to the north. And during this time the study area was very close to this spreading centre. Hence, we suggest in our model that, this proximity lead to formation of faults in the region with same orientation as that of the transform faults.

Comment: The text seems to suggest this is all still happening at the same time as the opening of the Mascarene Basin? (i.e. at the same time as the opening of the other grabens to the north?) --> so there is no phase II, in fact? **[line 129]**

Reply: No, we did not indent to suggest that. The paragraph is reframed for clarity.

Comment: what isochron maps? please provide citations **[line 131]**

Reply: We thank the editor for the comment. The reference to figure 3 is now added here.

Comment: write: "extensional deformation in rifts and rifted margin systems" **[line 172]**

Reply: The suggestion is incorporated in the MS.

Comment: the spreading ridges have different colors, please specify what this means. Also, it would be good to differentiate between spreading ridges and transform faults so that the reader will not mix them up (this is especially confusing in stage II, where extension could be interpreted both as SW-NE and NW-SE). Alternatively, add some arrows to indicate general plate motion directions **[fig. 7 caption]**

Reply: We thank the editor for the suggestion and the diagram is modified accordingly. Arrows are shown along the spreading centres to distinguish it from transform faults and show the direction of spreading. Extinct spreading centre is now marked in the diagram.

Comment: this is what is supposed to happen in stage III, so can't be of interest in stage II, it seems to me. **[line 192]**

Reply: We agree with the reviewer and this sentence is removed from stage II and mentioned in the second paragraph of discussion for clarity.

Comment: write "basin in the Paleocene" **[line 199]**

Reply: The suggestion is incorporated in the MS.