Public justification (visible to the public if the article is accepted and published):
Dear Cassel et al.,

Thank you for revising your manuscript and thoroughly replying to the reviewers' comments.

After reading the revised manuscript and your rebuttal, I think that there are two points that were raised by the reviewers that still require your attention:

1- The use of time (i.e., TWT) to describe primary observations from the seismic lines:

in your rebuttal you justify the use of time instead of depth by the lack of accurate/reliable seismic velocities, which would make any depth conversion highly uncertain.

However, your own modelling work (i.e., 2D flexural back-stripping) relies on depth converted sections.

This make me wonder how reliable are the modelling results that you have obtained?

- i.e., post-rift accommodation and its relationship with breakup volcanic addition.

Response

We apply flexural backstripping and decompaction to post-rift sediments only; we do not apply it to the extrusives volcanics below post-rift-sediments. As a consequence we avoid errors arising from the depth-conversion of extrusive volcanics. Errors in the depth conversion of post-rift sediment thickness will exist and affect the magnitude of water-loaded accommodation space determined by flexural backstripping and decompaction. However these errors are consistent between profiles and relatively minor so that the relative differences in accommodation space between profiles and our overall observation and interpretation are not changed.

2- One of your main conclusions is the depth in time at which first volcanics occur

- i.e., ~2s TWTT for magma-rich margin, and 6-7s TWT for “normal” magmatic margin.

This is confusing for two reasons:

(i) as one of the reviewers rightly highlighted, current models of SDR emplacement assume that they are subaerial flows, as you mention your conclusions. If these depths are not emplacement depth then what are they exactly?

Response

Magmatic extrusives commonly take the form of seaward dipping reflectors (SDRs), resulting from the lateral migration and accretion of both subaerial and submarine lava flows during rifting, breakup and initial sea-floor spreading (Harkin et al., MPG 2020). The reviewer statement (i) above is incorrect ; it implies that the current model of SDR emplacement assumes that all SDRs are formed as sub-aerial flows. It is only correct to say that some SDRs, usually with long lateral flow lengths, are emplaced as subaerial flows. However this does not apply to all SDRs. Many occurrences of extrusive magmatism at rifted margins (perhaps the majority) with sea-ward dipping attributes (i.e. SDRs) have deposition with relatively short flow lengths and are emplaced in relatively deep water.

(ii) What are the geological/physical processes/factors that control this depth of first volcanics?

Response

The water depth of first volcanics is controlled by the isostatic consequences of the relative timing of crustal/lithospheric thinning and the onset of melt production by decompression melting (see Chenin et al 2023). Factors advancing the initiation of melt production with respect to crustal/lithospheric thinning are elevated lithosphere and asthenosphere temperature and/or inherited lithosphere chemical enrichment. Factors delaying the initiation of melt production with respect to crustal/lithospheric thinning is inherited lithosphere chemical depletion.

I think that these aspects need to be addressed in the manuscript to remove some of the remaining ambiguities regarding your work and your results.

Mohamed Gouiza