We thank reviewer 2 for the review. We have responded to all comments and suggestions which we found constructive and will improve our paper. Our responses to the reviewer's comments and suggestions are shown below.

Review 2 - Anonymous

Review of "Along strike variations of volcanic additional controlling post breakup sedimentary infill"

This manuscript provides a useful insight into the ongoing evolution of magmatic margin and their associated sedimentary basins. Although the focus is the Pelotas margin, there are wider implications.

There are number of details comments below, but there are three specific aspects that need to be considered before the manuscript is appropriate for publication.

- Throughout the study there is no clear differentiation of basement and no discrimination between oceanic and continental crust. For margin development I think it is critical that more consideration is put into this component. While the data itself may not be present to define this, there are sufficient publications on similar data that more detail could be included. I also think more coverage of SDR formation could be included. This is important because it is fundamental to how we interpret such margins and especially as SDRS are an intrinsic part of margin formation. The way the manuscript comes across it appears that SDRs are emplaced onto 'basement', rather than the emplacement of SDRS (or at least outer SDRs) are simply the shallower component of an over thickened magmatic/oceanic crust development. Whether the authors agree or disagree with this it is essential that this argument is presented. This is essential because 1) where SDRs are limited is this just because there is greater proportion of sub-SDR magmatism hence along trend magma volumes are not simply a function of SDR thickness. 2) When rotation is undertaken magmatic crust thickness is not simply a function of present day vertical thickness – what impact does this have on estimations of magma supply?

Reviewer 2 identifies an important point. It looks strange and non-geological to show sections where oceanic crust and continental crust are undifferentiated (although with different ages) but the SDRs have a different colour suggesting that the SDRs are deposited over a crust that already formed. Ideally we should differentiate continental basement, magmatic additions (SDR/Underplates) and oceanic crust – but this is not possible to do reliably with the available data. It is also not necessary because we do not discuss how the oceanic crust and magmatic addition form. We will modify figures 2, 5 and 8.

Our aim is to identify how seismic observations in TWTT can be used to identify magma rich margins without involving the difficult and unreliable interpretation of basement type (thinned continental crust, hybrid crust, oceanic crust). We aim to focus on observations that can be reliably determined.

- Current SDRs models invoke emplacement at sealevel; the backstripping suggests significant water depth when backstripped. This is incompatible with SDR emplacement but is not discussed. A more comprehensive discussion of this has to be included as to how appropriate is backstripping for such margin and what the role of isostacy and thermal perturbations are when backstripping is undertaken.

The purpose of our flexural backstripping is to produce sediment post-breakup accommodation space. We do not restore post-breakup thermal subsidence to produce breakup palaeobathymetry. Our aim is not to examine the deposition of SDRS and their palaeobathymetry.

- A central premise of the manuscript is the control of the margin on overburden and along margin variation– as noted in (1) a much more compressive discussion of crustal thickness (continental vs oceanic) has to be undertaken including what sits beneath SDRs. In addition there is no discussion of the role of paleogeography and sediment supply, eg. Drainage and sediment entry in any substantial way. There is a discussion that the backstripping sediment can be used to estimate thickness but this needs to be correlated with additional sediment supply data.

The aim of the paper is not to explain the evolution of the margin but is to analyse, using quantification methods, the relationship between the magnitude of volcanic additions and post-breakup accommodation space for sediments. We do not need to examine the sedimentary-evolution of the margin so it is not important where the sediments come from. Also we do not need to examine the geological evolution of the margin sections. We deliberately avoid speculating on the nature of the underlying crust which cannot be determined with any certainty.

- Suggest there should be consistency of using depth converted data Currently starts with TWT then Z(m) – suggest more consistency having depth conversion from the outset

For good reason we prefer to use the primary seismic observation which is in TWTT. Depth sections are models which are dependent on the seismic velocity used in the depth conversion. At volcanic margins it is very difficult to accurately determine seismic velocities for depth conversion and any resulting depth sections are uncertain.

Specific comments

Introduction – this really needs more on SDR and magmatic margin formation processes that addresses crustal nature below SDRs – need to define what basement is at each part of the section,

The formation processes of SDRs and magmatic margins is not the aim of the paper. Our observations do not depend on the formation processes.

Regarding basement, we will update figures and text as said earlier.

This is specifically relevant for Line 44 – it is the volume of magma that is important not just SDRs.

We purposefully avoid estimating the total volume of magma including intrusives – it is difficult/impossible to determine with any accuracy as explained in Tugend et al. (2018) and Chenin et al. (2023)). We focus on the volcanic/extrusive section, since it can be mapped/observed. We assume that the thickness (and interval TWTT) of the volcanic/extrusive section is a proxy for the

total magmatic addition since it represents a fraction of the total magmatic system, usually considered to be 1 to 2 or 1 to 3 (Crisp, J.A., 1984.)

Line 45 – how representative is this and what implications are appropriate for other margins?

We will reword this to better explain what we mean (and not overstate)

Line 85 – basement characterisation in text and associated figures is required

We will update the figures and text regarding basement as discussed earlier. Our aims are to determine the relationship between the magnitude of volcanic additions and post-breakup accommodation space for sediments which does not need the nature of basement to be known.

Line 88 – "top basement is a smooth horizon onto which the SDRs downlap" this is not substantiated by the data presented and is very different interpretation than current models of SDR formation.

The base of SDRs is difficult to map and we will state that in the text. We make the assumption that top basement is smooth as an approximation so that we can make measurements.

Line 91-2 – 1st mention of basement shape – tapering, box shape. No discussion of what this means, how it is defined and what relevance is. Also how much does this geometric configuration rely upon definition of continental or oceanic crust?

We understand reviewer 2's comment and need to explain "basement shapes" more clearly which we will do in the revised text. We will also add a reference to Chenin et al. (2023) which expands on factors controlling margin shape. Because our paper aims to make quantified observations, we need to make compromises such as using simple first order interpretations rather than complex interpretations that may not substantially change the quantification results.

Line 95 – this seems slightly unnecessary for this paper

We agree – this is not necessary and we will delete

Line 100 Figure 2 caption is incorrect

We agree – we will correct

~Line 105 – suggest this is all depth converted from the outset

As explained earlier we prefer to work with time sections and TWTT which is the primary seismic observation rather than depth sections which are a model dependent on depth conversion seismic velocity which is difficult to determine accurately at volcanic margins.

Figure 3 – this highlights the importance of defining basement and a more detailed discussions SDR and its sub-crust. For example in b if SDR and magmatic crust is considered as a single crustal type (ie overthickened oceanic crust) this has a very different implication.

Ideally, we agree that it would be good to define basement type distribution including magmatic underplate and the limit of continental crust and the onset of oceanic crust. However, these are not easy to observe with accuracy and would produce non-unique interpretations. In our paper we take the SDR section as a mappable unit and assume that it is representative of the "total" magmatic addition and that basement can be treated, independent of its composition/history, uniformly. Fig. 8 demonstrates that these simplifications are reasonable since they predict the TWTT of the onlap of magmatic systems.

Line 124 – very difficult to make a discussion of sediment supply with more extensive discussion, and indeed from a 1D perspective rather than 2D at least.

The purpose of figure 4a is to show the difference between the 4 profiles. We agree that the vertical axis values will depend on sediment supply which is unknown. This is the reason that we determine accommodation space using flexural backstripping which corrects for the laterally variable unknown sediment supply.

Line 129- volcanic addition would be fine if it was all onto continental crust but as defined basement includes oceanic crust therefore need further discussion of SDR formation

Yes we agree. We will add text to explain this. This is also why the TWTT of first volcanics is so useful.

Line 134 – where is crustal basement, how would this change?

The post-rift accommodation space would not change. We will clarify.

Figure 5 – generally assumed that SDRs are sub aerial but backstripping does not restore these the SDR packages to sea level. This must be discussed further

See earlier response to this comment – we do not restore post-breakup thermal subsidence

Line 145 – if accommodation space is estimated from backstripping, then need to consider the point raised above – i.e. SDRs at sea level. This comment applies to this whole section.

See earlier response to this comment – we do not restore post-breakup thermal subsidence

Line 165-170 – there are some significant assumptions made in this statement. This needs further justification.

We will explain this more clearly

Line 188- magmatic volume - needs further justification as to whether extrusive SDR is equivalent to magmatic volume which again goes back to defining basement.

We will add further discussion

Line 228-233 – what is the evidence of significantly underfilled sun-rift basins? This would be apparent from the geometry of the basin fill

The point we make here is that if syn-rift accommodation space is filled with volcanics it is not available for later (post-breakup) accommodation space.

Line 240 – not sure how this fits with the original premise of the paper?

We believe that this is a very important observation with important implications.