Dear Editor,

We thank the reviewers for a constructive set of reviews that will improve the manuscript. We have responded in detail to them in the attached document, and included text that we would include in the revised manuscript.

Thanks,

Luke Wedmore (on behalf of co-authors).

Our responses to the reviewer 2's comments are shown in blue text. **Specific changes that we will make to the text are in bold font.** The line numbers quoted refer to the revised version of the manuscript that we will resubmit if invited.

RC2

Specific comments:

Using an empirical relationship between the fault length and moment magnitude of earthquakes, the authors conclude that the fault could induce earthquakes up to Mw 8.1, a value that is greater than the historically recorded events in southern Africa. My concern is how confident are you with the resulting estimates, because it seems to me that there's a certain degree of uncertainty here.

We agree with the reviewer that there is a degree of uncertainty here, particularly because there is *a lot* of evidence from other rifts in East Africa that faults are highly segmented, and thus less likely to rupture along the whole extent. We attempted to look for evidence of segmentation along four of the faults (Chipola, Molaza, Chitumbi and Kabungo). Unfortunately, we concluded that the SRTM data that we used was not of sufficient resolution to allow us to resolve any segment boundaries. Nor is segmentation alone a preclude to these fault's hosting Mw 8.1, given that earthquakes can rupture through segment barriers (Hamling et al 2017, Du Ross et al 2016)

Furthermore, we outlined that smaller magnitude events are more likely that the headline Mw8.1 figure and outline a method to calculate the probability of smaller magnitude events: "*although we do not directly observe evidence for fault segmentation in the Luangwa Rift, the data provided here can be used to incorporate small ruptures along these faults into seismic hazard assessment by combining the provided slip rate, fault area, and magnitude estimates with a regional b-value (Poggi et al., 2017) and the methodology developed by Youngs and Coppersmith (1985) to develop continuous recurrence models for these sources (Williams et al 2022)*" [lines 456-459; Section 5.3]

However, in response to the reviewers concerns and also reviewer 1, we will amend the text to make it clear that we consider these the maximum possible magnitude events, and to explicitly clarify that we attempted to assess segmentation:

"***We estimate that the Molaza Fault is a seismic source capable of hosting an earthquake with a maximum magnitude of Mw 7.8***" [Lines 432-433]

"…with the 207 km long Chipola fault capable of hosting up to a M_w 8.1 earthquake" [Lines 440-441]

"To estimate the magnitude of smaller segmented ruptures, we attempted to identify fault segments for the four best exposed faults in the Luangwa Rift by systematically measuring along-strike fault scarp heights (Figure 10)" [Lines 449-450]

Technical corrections:

- Line 57: 'Figure 1 & 2' should be 'Figures 1 & 2', and same for the rest, i.e., lines 216, 224, 225, 228;
- Line 105: The abbreviation was 'EARS' (Line 54), not 'EAR', same for Line 248;
- Lines 112 - 113: The same sentence appears as the first sentence of the last paragraph;
- Lines 120 and 123: The audience would be benefited with the full names of GEM (Global Earthquake Model) and GIS (Geographic Information System);
- Lines 168 - 170: Please check the sentence;
- Lines 186 and 187: Dav or dav?
- Line 213: Do you mean Figure 5?
- Line 261: trees?
- Line 394: The abbreviation of 'LRZ' has not been indicated before.

We will correct all of these – we thank the reviewer for they helpful comments and careful review.