"Spatiotemporal ITCZ dynamics during the last three millennia in northeastern Brazil and related impacts in modern history" presents a new composite speleothem $\delta^{18}O$ record (using new data and previously published data) as well as a new $\delta^{13}C$ record used to characterise precipitation and vegetation/soil cover over northeast Brazil for the Late Holocene. The authors make clear links to the necessity for this research in South America, and frame it within the context of the increased proportion of the Brazillians who experience water scarcity in modern times. By analysing samples taken from sites at the southernmost extent of the ITCZ, they are able to link periods of changed precipitation to the movement of the ITCZ.

Strengths

This is relevant research with tangible outcomes for policy. Combining multiple stalagmite proxies can overcome some of the drawbacks encountered by single-proxy studies. It is great to see the continued use of already-published data, supplemented by new data. I really enjoyed the links between the proxy record and historical climate events – finding historical climate information is non-trivial, well done to the authors for their persistence. The introduction and study set-up is good.

Weaknesses

The main weakness of the manuscript is that there is no consideration of the impact of hydrological processes on speleothem $\delta^{18}O$, the primary proxy of the study. Treble et al. (2022) showed in a global analysis of coeval calcite and dripwater samples that karst hydrology exerts a control on speleothem $\delta^{18}O$, and that the variability of $\delta^{18}O_c$ can exceed that which can be attributed to rainfall $\delta^{18}O$. In the absence of cave monitoring data in the paper, the authors should add some discussion of how the karst processes at each site impact their results (or could impact their results) and how the composite handles this variability. The introduction/literature review should do also do a more thorough job of what controls $\delta^{18}O$ in NEB. The RN composite appears to only have uncertainty in the time domain, while other composites (e.g. Kaufman et al., 2020) include uncertainty in the composited proxy value.

Specific comments and questions

1. Figure 1

Please shade either the land or the ocean to differentiate them. Please choose an accessible colour palette – the rainbow colour palette is not useful for colour blind readers.

2. Line 163: please clarify whether you analysed the precipitation data as annual (or hydrological year), monthly, or daily totals.
3. Figure 2

Please change green dots to another colour (black?). Please also change the green line in the top panel to a different colour.

Consider changing the red-blue colour palette – in maps this palette is often used to show temperature variability, and so I find it slightly misleading here.

Please change the legend in the top panel to 'Site precipitation – GNIP' and 'Site precipitation – ANA' to be consistent with 'Site $\delta^{18}O$ – GNIP'.

The caption suggests that the correlation map correlates observed precipitation against observed $\delta^{18}O$ – suggested rephrase: "Figure 2 – monthly mean observed precipitation amount for ANA stations and $\delta^{18}O$ values for GNIP stations (IAEA-WMO, 2021) (green dots), with correlation maps between gridded precipitation anomalies and GNIP $\delta^{18}O$ anomalies…." And then carry on from (a) with the rest of your caption, while also adding (star 1) at line 201 for Pedra das Abelhas station.

Please clarify what correlation was used.

The difference between GNIP rainfall amount and ANA rainfall amount is really large between Fortaleza and Pedras de Abelhas. These sites are so close, have you double checked that that is correct?

4. Line 184: add reference to Fig 2.
5. Line 190: add ref to Fig 2C
6. Line 208: why 1960 – 2016 as a reference period? The WMO uses 1961-1990 for long-term monitoring, or the 3 decades prior to the most recent year ending in 0 (e.g. 1991 – 2020) for short term changes. Could you please justify your choice or change to a standard ref. period.
7. Line 216: Figure 2C.
8. Line 272: typo, please correct to 'would not affect'
9. The $\delta^{18}O$ data are of different resolutions – can you please clarify how the iscam handles differently-sampled data
10. Line 331: please change 'first 1800 years' to 'the period spanning 1940 CE to 130 BCE' for less ambiguity.

More detail is needed about the C-A correction and how it was calculated (this could go in the Supplement. Could you please add the initial mean and corrected mean $\delta^{18}O$ values for each interval to your Table S3. Something like the below?

Table S3 – Speleothem intervals according to texture and mineral weight proportion (wt). Texture description: A - crystals with mosaic and columnar fabrics; B - interbedded needle-like crystals. *Obtained by Utida et al. (2020).

Speleothem Mineralogy					
Sample	Interval (mm)	Age (yr BCE/CE)	Texture	Aragonite (wt %)	Calcite (wt %)
TRA5	30-54	1855 to 1745 CE	A	0.0	**100.0**
	54-87	1745 to 1640 CE	A	0.0	**100.0**
	87-108	1640 to 1565 CE	A	0.0	**100.0**
	108-178	1565 to 1490 CE	A	0.0	**100.0**
TRA7*	0-173	1940 CE to 130 BCE	A	0.0	**100.0**
	173-215	130 to 290 BCE	B	**99.0**	1.0
	215-270	290 to 3000 BCE	B	**87.1**	12.9
FN1*	0-27	1790 to 1170 CE	B	**85.2**	14.9
	27-83	1170 to 610 CE	B	**90.6**	9.4
	83-128	610 to 80 CE	A	0.0	**100.0**
	128-202	80 CE to 1730 BCE	B	**94.5**	5.5
FN2	6-31	189 to 660 BCE	B	**94.7**	5.3
	31-56	660 to 960 BCE	B	**94.8**	5.2
	56-63	960 to 1,005 BCE	B	**94.8**	5.2
	63-95	1,005 to 1,265 BCE	B	**93.4**	6.6

11. Can you please move Figure 3 earlier in the manuscript.
12. Line 362-368: I suggest you reword this to demphasise the 4.2 ka event (which your record mostly postdates). Something like “A generally drier climate prevailed in NEB after the 4.2 ky BP (Before Present) event in the Mid-Holocene (ref). This led to the development of the Caatinga, a sparse vegetation cover which has persisted in NEB to the present (ref). These drier conditions ….”
13. Line 368-9: it is unclear if this is statement ‘more negative $\delta^{13}C$ values in stalagmites are associated with…’ refers to NEB samples or is a general statement. If general, please add impact of temperature and PCP (see Fohlmeister et al. 2020), and perhaps relocate this to the literature review.
14. Figure 3

As for other figures, please change the colour scheme.

Please make the lines in the legend thicker so that the colours are easier to see.

Please update the 99% confidence interval to a shaded band – the two cyan lines are hard to see (assuming there are 2? In some places it seems like the black line is outside of the bounds of the 99% confidence interval? E.g. see ~1100 CE).

The U-Th data should have a label (i.e. a) to be consistent with the other data presented here.

Can this figure be combine with Figure 4? There is a lot of overlap.

Are the older TRA7 $\delta^{13}C$ data needed – suggest removing them if they are not referred to in the paper.

15. Figure 4

As for Figure 3 re. colour palette, composite, and U-Th data.

Have you quantified the difference in $\delta^{13}C$ between samples? From ~1500 CE onwards they don't appear to covary closely.

16. Line 417: can you please expand on why DV2 and the RN record differ? "The general trend towards more positive values" – please add over what time period this trend occurs, as I don't think it persists over the whole records.
17. Line 421: please change 4.2 ka BP, or whatever convention you choose and be consistent throughout.
18. Line 452: please explain why you think AMV and RN decoupled after ~0 CE.
19. Figure 5

I think you have accidentally plotted the Lapointe AMV backwards.

20. Line 503: please move Figure 6 up to about here.
21. Line 520: please capitalise 'Indigenous'
22. Line 521 – "Entire Indigenous tribes died of starvation as a consequence of this drought and a related smallpox epidemic" – this suggests the smallpox outbreak was caused by the drought – is that correct? Suggest rewording to "Entire Indigenous tribes died of starvation as a consequence of this drought and a concurrent smallpox epidemic"
23. Line 529: what is the age error at 1770 CE – adding the uncertainty might bolster your point that this event is the 1776-1778 drought
24. Line 535: as per above please add age uncertainty.
25. Line 544: suggest reword to "Although the TRA5 speleothem chronology precision is reduced during the last ~150 years…"
26. Figure 6: as for earlier figs, add a, b… label for U-Th data
27. Line 567: "these data suggest a trend toward increased aridity over NEB from 3000 BP to present…" Please be consistent with use of BP vs BCE. At line 495 you say the last 500 years were the wettest of the last 2 millenia, which contradicts the above statement.
28. Line 572: "drought period between 1500 and 1750" – Is this referring to the drought events in TRA5? The wording suggests it is linked to the RN composite, which shows abrupt change at~1500 CE to wetter conditions. Could you please clarify.
    Throughout, I suggest you make sure you are consistent with naming conventions between samples and between the composite record and the individual samples. Perhaps consider adding sub-headings to differentiate the longer composite record and the more recent drought record.
29. The data availability statement is missing.
30. Table S1and S2 – please use a different symbol to denote data from Cruz et al. as * is used elsewhere in the table
31. Alves 2003 – this link is broken and I could not find the article at the website.

References

Kaufman, D., McKay, N., Routson, C., Erb, M., Dätwyler, C., Sommer, P.S., Heiri, O., Davis, B., 2020. Holocene global mean surface temperature, a multi-method reconstruction approach. Sci Data 7, 201. https://doi.org/10.1038/s41597-020-0530-7

Treble, P.C., Baker, A., Abram, N.J., Hellstrom, J.C., Crawford, J., Gagan, M.K., Borsato, A., Griffiths, A.D., Bajo, P., Markowska, M., Priestley, S.C., Hankin, S., Paterson, D., 2022. Ubiquitous karst hydrological control on speleothem oxygen isotope variability in a global study. Commun Earth Environ 3, 1–10. https://doi.org/10.1038/s43247-022-00347-3