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Climate of the Past Discussions

Interactive comment on "Possible expression of the 4.2 kyr event in Madagascar and the south-east African monsoon" *by* Nick Scroxton et al.

Nick Scroxton et al.

nick.scroxton@ucd.ie

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"Climate of the Past Submission cp-2020-137, "Possible expression of the 4.2 kyr event in Madagascar and the southeast African monsoon" by Scroxton et al., presents evidence from stalagmite AK1 from Anjohikely cave, northwest Madagascar and makes inferences about climate from 5000 to 2000 years BP. The most profound inference is of a "period of drought that lasted continuously from âĹij 4.32 and 3.83 ka BP". The authors have highlighted the hiatus recorded in the stalagmite AK1 between 4.32 and 3.83 kyr BP, replicating a hiatus in another stalagmite from nearby Anjohibe, and therefore indicating a significant drought around the time of the 4.2 kyr event in the region. The fundamentals of this research project are entirely based on the hiatus recorded in the stalagmites. The study draws on a stalagmite, AK-1, from Anjohikely cave, north-

west Madagascar. I infer that the manuscript draws its scientific conclusions about the 4.2. ka event is from the hiatus recorded in the stalagmite AK-1, and comparisons with the previously published studies. Suggestion 1. I think it should be, hence, provide the explicit petrographic studies of the hiatus. The layer bounding studies as discussed by Railsback et al., 2013 is important for this project because it will provide robust evidence demonstrating if the periods of non-deposition, either because of exceptionally wet or dry conditions. Reference : Railsback, L.B., Akers, P.D., Wang, L., Holdridge, G.A., Voarintsoa, N., 2013. Layer-bounding surfaces in stalagmites as keys to better paleoclimatological histories and chronologies. Int. J. Speleol. 42, 167–180."

The rational for a growth hiatus is explained in the opening paragraph of section 5.1 (updated to section 5.2 in the revised version). Briefly, 1) AK1 shows a positive excursion into the hiatus typical of a drying drip. 2) the hiatus is replicated in ANJ94-5 from nearby Anjohibe, which suggests the hiatus is driven by climate rather than a drip specific or cave specific change, 3) ANJ94-5 also shows a positive excursion into the hiatus, indicative of drying.

This comment is very similar to one made in the public comment by Ny Riavo G. Voarintsoa. We respect both of the commenters opinion that additional evidence is needed for a dry hiatus:

Upon reinspection of AK1 images. We can confirm that there are no truncated layers, a slight thinning on the stalagmite, an increase in d18O into the hiatus and a contraction crack (likely formerly aragonite) with little detrital material. We therefore believe this to be a Type L layer bounding surface, one caused by decreased precipitation. We have added this description to our results section and included the Railsback et al., 2013 reference. We believe that our manuscript is more robust and thank both the reviewer and Dr. Voarintsoa.

The paragraph now reads: Between 4.30 and 3.84 kyr there is a growth hiatus. The layer bounding surface has no truncated layers, a slight thinning on the stalagmite, an

increase in ïĄď18O into the hiatus and a contraction crack (likely formed by the conversion of aragonite to calcite) with little detrital material. We interpret the layer bounding surface as Type L, one caused by decreased precipitation (Railsback et al., 2013). Further, the hiatus is replicated in stalagmite ANJ-94 from Anjohibe at (4.20–3.99) (Wang et al., 2019b), also with a positive isotope excursion just prior, ruling out cave or drip specific drying. The replicated hiatus likely indicates dry conditions and potentially the driest conditions of the mid/late Holocene. The 4.2 kyr event therefore appears at least locally remarkable in northwest Madagascar. A dry anomaly is the opposite to the wet conditions recorded at 8.2 kyr BP (Voarintsoa et al., 2019), a Holocene climatic anomaly often viewed as a greater magnitude version of the 4.2 kyr event (Bond et al., 2001; Wang et al., 2013)

In addition, we are also returning to the stalagmite to see if a more detailed review of this layer bounding surface is necessary. We will report back as part of the formal response to the reviewer, but wanted to give this response more quickly, as part of the discussion phase.

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