

## ***Interactive comment on “A post-wildfire response in cave dripwater chemistry” by Gurinder Nagra et al.***

### **Anonymous Referee #3**

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#### General comments.

Monitoring studies such as this provide insight into karst and speleothem processes and as such are valuable data sets for the scientific community. Understanding the response of karst systems to fire is potentially a great asset for paleoclimate interpretations, as it may be a new way to track past limitations in water availability. Application of a forward model to aid in the interpretation of the monitoring data is also a valuable aspect of this study. However, the manuscript lacks rigor in the presentation and interpretation of the results as well as in the overall presentation. For example, the abstract provides no results that would support any of the conclusions.

The writing needs significant improvement. There are many run-on sentences, poorly defined terms, awkwardly phrased sentences, etc. I point out only some examples

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in the detailed comments below. The writing obscures the meaning and the scientific message. For example, the abstract should be a factual summary of the contents of the paper, but results are only alluded to rather than specified.

The application to speleothem studies discussion in the Conclusions should be its own section and come before the Conclusions. To be useful to other researchers, it would be helpful to provide exposition of the subtleties that would be involved in such applications. For example, 1) how many different proxies would be needed to delineate fire influence, given that d18O in speleothems is affected by many processes, including in-cave processes not related to climate or vegetation disturbance?; 2) How would a researcher delineate between drip sites impacted by fire but without a tree in the recharge zone for the drip, vs. climate processes, vs. in-cave processes?

Specific and technical notes.

Line 28. How is the analysis unique? What specifically is unique about this analysis?

29-31. Run-on and awkward sentence.

33. This is the most significant claim of the study. Explain how the d18O, chemistry, indicate and support this claim. There is nothing in the abstract that provides any hint of what the results of the study are.

35. How so? What are the results that indicate this?

36. 'here we open a new avenue for speleothem science': Without answers to the above questions, this statement is not supported.

46. 'local environmental factors' such as...?

48-49. Monitoring studies have also focused on controls on calcite growth, the role of CO<sub>2</sub>, respiration, and other factors and processes (Wong et al. 2011, GCA; Breecker et al. 2012, GCA)

51. AET – define acronyms upon first use. AET is not defined until figure 3.

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52. Is this 'the exception' or the rule? There are many more monitoring studies in water limited regions, including those cited above

62. Wong reference – this study is not an example of vegetation loss due to fire.

74. give cave name and location

75. see comment on abstract re 'unique'; 'analysis' is used twice in this sentence.

85-6. Give length of time comprised by temp record; give geologic age of Tamala Limestone.

113. 'heterogeneous' in what way?

114-5. make into two sentences

123-5. state the length of the collection interval.

129, 132. State location of instruments. Is the ICP-AES a spectroscop or spectrometer? List it as such.

137. ANSTO: define acronyms on first use.

145. Was this drip size verified for the site? Why refer to an experimental study if you have both drip speed and volume/time?

151-4. What does 'this' refer to? RMC? P-AET? This is a run-on sentence and hard to follow.

157 what is 'FEW'?

160-161. define terms upon first use, which is much earlier than here

170. How far away? Yanchep is not on the map FIG 1.

178-9. Only one year different from the study's fire. Was the burn less intense? Less destructive? How did it effect the lower and middle understory growth?

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184-7. Run-on sentence

188. the 'latter' what? Several different things are developed in the previous sentence.

192-4. confusing sentence, try restating as: 'Storage time for water that enters the seepage reservoir is modeled as a Gaussian distribution. This time is set as a maximum age of 3 years to reflect the shallow depth of our cave system. The model allows for the mean and standard deviation to be specified for these functions.' Furthermore, what is this based on? It's more the nature of the flowpath through the vadose zone than it is the thickness of the vadose zone that will determine storage time. It seems that this value is adjusted later based on observations at the cave, but need to have a basis for this starting point.

198. What is 'a karst store'?

217. Why 'soil water availability' here, and 'water availability' above?

224. 'increases' should be past tense

236-9. Run-on sentence

239. Add (DFJ) for northern hemisphere readers

240-1. when first defining 'thresholds' also define it in context of 'seepage thresholds'

243. Unclear. Try rewording: 'We attempted to model dripwater d18O that matched the measured drip water values based on using the rainfall isotopic data set as our input?'

244. Is 30 mm rainfall? State this. Could other variables in the model cause the shutoff?

247-251. Run-on.

253. is this the mean or the weighted mean?

265. What makes a given model 'meaningful'?

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273-4. try rewording to: 'This is similar to a type 1 scenario defined by Cuthbert...'

288. Interpretation, not Results, belongs in Discussion

291-6. difficult to follow, rewrite.

300. Arguments should be in Discussion, not Results.

316. For sure evaporation will affect chloride in water in the same way dilution and mixing will, not potentially.

348. This figure shows no diagnostic model, even though the caption states that both sites fall within the model, the figure doesn't show it.

358. Unclear. If 3 increases Ca in dripwater, why would dripwater not reflect the increase? Is the signal from 1 and 2 so large as to make 3 background? Or is it simply sequence of events? Run-on sentence.

389. Reference figure earlier in text when describing site and processes.

450-2, and 455. This is new information, more appropriate to include it prior to Conclusions

456-7. Further, that a fire signal may be much more subtle in a speleothem if the fire impacted drip sites without trees above them.

458. Growth rate not covered in text, this is more new information that is more appropriate to include prior to conclusions. See general comment above about.

Fig. 1. Where is Yanchep National Park located? Where does the inset sit on the map of Australia?

Fig. 2. The same data are presented in Figs. 2 and 6. Only one of these is needed. If the authors are going to employ the Sinclair graphical model, then it would be Fig. 6. However, the discussion of Fig. 6 in the text and caption claim to show that the Sinclair PCP model holds and can account for the trends, yet there is no text or addition to

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the figure that supports this claim. In Fig. 2, state that the values plotted are for drip water. The interpretation given that both (each) site has an independent flow path is not explained. What specifically indicates this? Different starting points? Distinct slopes?

Fig. 3B. It's difficult to see Site 2a measured values. Since 'Est Dis', 'Meas Dis' used, also label sites as 'Calc' for clarity.

641. concentrations appear to be quadruple, not 'double' that of Site 2a. 643-4. differentiation of temporal trends between 1a and 2a: I disagree with trying to make a difference here, as the data do not support this. Both sites show nearly the same slope of increase and the trends are obscured by gaps in the time series.

Fig. 4. Explain which thresholds. Why would the 10-75 mm threshold have a lower response than the 10-15 mm model? Why not present time series for the proposed fire-sensitive ions such as SO<sub>4</sub> and P? Show where the fire event occurred in relation to the time series.

Fig. 5. Move Mean rainfall to below rainfall. Use color other than red since red is for cave drip info. Is the mean rainfall the mean or weighted mean?

Fig. 6. Place both sites on same plot with different symbols, in order to help the reader directly compare them. See comments above on Fig. 2. Presentation of time series for these element ratios would aid in their interpretation and how the processes proposed to account for the variation change with seasons, etc.

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