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Discussions

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Interactive comment

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

Anonymous Referee #2

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This manuscript presents a high quality cave monitoring study from 2005-2011. The authors collected a suite of analyses to better understand cave and climate processes, and ultimately how these signals are incorporated into speleothems. A major focus of this manuscript centers on how a fire above the shallow cave affected local vegetation above the cave, and as a result, the dripwater chemistry inside of the cave. However, this manuscript requires major revisions to address the lack of data from before the fire to establish exactly how the cave responded to the fire. While it is impossible to collect data from before the fire, the discussion should be re-worded using less definitive language that the fire was definitely the cause and offer alternative scenarios to explain the data. This should include a more quantitative comparison to similar caves to assess non-fire-forced, natural heterogeneity in dripwater chemistry, whether this is enough to explain the observed changes (i.e. not from a fire).

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Plot the raw rainfall d18O time series in Figure 3c along with the forward model dripwater d18O. It will be interesting to see how the model alters the above-ground signal.

Why is the modelled dripwater d18O so much smoother than the dripwater data? Is the temporal resolution of the rainfall collection too low? Or is the rainfall data being smoothed too much by the model?

Lines 262-264: The slope calculations are subject to serious edge effects. For example, the modelled dripwater d18O has an inflection point early in the record in 2006. This is not observed in the dripwater data. Perhaps you could use a bootstrap to calculate the error on the slope, but given the high density of points in blue curve of Figure 3c leaving out one or two or even three points probably will not change the slope too much. But it is this inflection point early in the modelled dripwater record – that is not in the actual data that is causing the very different slopes. The trend over both look very similar from 2007-2011. Also, the slope at for site1a should be compared with the slope of the modelled d18O over the same time period: ∼2005-2007. Therefore, I'm not convinced that evaporation is driving such a large difference in the dripwater d18O.

Plot the Mg/Ca and Sr/Ca time series. I cannot do the calculation in my head using data from Figure 3e, f, and g. Do they co-vary in time? Or is the ln(Mg/Ca) vs. ln(Sr/Ca) relationship driven by changes that are not coeval?

Mark on Figure 3 when the fire occurred.

Line 331: how do pre-fire Cl values compare between caves?

Lines 333-334: without values from before the fire, it's hard to discern exactly what is the cave response to the fire. Could it not be that at Site 1a there was a spike of Cl, Mg, Ca, and Sr after the fire due to dissolving ash (Lines 357-358)? Then the downward trend would be the slow removal of those from the surface and sub-surface. Without data from before the fire to establish a baseline, most of the arguments about what the fire did are too speculative and unsupported.

Lines 374-377: again without pre-fire values, how is this supported? If the increased SO4 and K are from the fire, then shouldn't they decrease after the initial spike from the fire? They look quite steady, or even increasing. How much are the median values in Yonderup greater than Golgotha? Could the difference be related to heterogeneity of bedrock or type of vegetation? How do they compare with other semi-arid cave environments? There are too many other factors to pin it directly on the fire.

Lines 430-431: The differences between Yonderup and Golgotha should be quantified. Listing many values in the table does not support the differences quoted in the text. There are 10 differences to calculate 2 sites at one cave, 5 sites at the other. From the population of 10 differences, one may then calculate the median, mean and standard deviation. Then it will be clear 1) how much the drip chemistry differs and 2) how much variability exists just heterogeneous environments, which means to say *not* fire-related.

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