

Interactive comment on “Isotope hydrology of dripwaters in a Scottish cave and implications for stalagmite palaeoclimate research” by L. Fuller et al.

L. Fuller et al.

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p. 549. The comment refers to the fact that shorter-term speleothem records have a more limited dynamic range than those that straddle major climatic boundaries. However, it is also true that there is a major drive for changing oxygen isotope values in monsoonal areas where the amount effect is very strong. In such areas, large systematic changes are seen during the Holocene in response to insolation forcing and under these circumstances, details of the cave environment are only second-order factors. However, where the forcing of oxygen isotopes is much weaker, as in Scotland, the situation is different.

p. 550. The referee requests an indication of the minimum amount of information

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that is required from an individual drip-site before meaningful climatic information can potentially be derived from any associated stalagmites. The answer is none since the community has learnt a great deal about climate from stalagmites whose feeding drip dried up long ago, or which was not sampled. However, dripwater information provides direct evidence as to the presence or absence of bias in relation to mean precipitation composition and also provides information on the seasonality expected in the speleothem and so increases the confidence with which high-resolution information can be extracted from it.

p. 551. Hurrell (1995) presented correlations between winter (December to March) NAO index and winter precipitation and Stornoway had a particularly high r value of 0.75. The referee specifically asks about annual precipitation, but the relevant parameter for speleothems would be water excess given the significant evaporation in summer. Our calculations are that there is a correlation between annual water excess and annual mean NAO index with an r value of 0.56.

Hurrell, J.W. 1995 Decadal trends in the North Atlantic Oscillation: regional temperatures and precipitation. *Science*, 269, 676-679.

p. 552. In principle, changes in the seasonal temperature regime would impart noise to the hindcast and this is linked to the seasonality of the [speleothem] precipitation which is predominantly related to PCO₂ variations. However, these are second-order effects.

p. 554 and Figure 3. The dripwater data plot below the Global Meteoric Water Line (i.e. the deuterium excess is less than 10) presumably because the humidity of the air in the source region for the moisture is higher than the 85% that characterizes global mean conditions. This observation does not give us more information about local conditions. p. 556 and Figure 4. The referees comment about variation in oxygen isotope composition, referring to the conclusions, are addressed in sections 4.2 and 4.3 of the paper. There is a typographic error in the comment: we interpreted the stored com-

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ponent as >1 year, not <1 year. Figure 4c illustrates how all but one of the dripwater compositions converge to mean values during dry periods which justifies our comment that the storage water is relatively well-mixed. In late 2004, most drips became isotopically heavier which tells us that there is a fracture-fed quickflow component. If this component had had the composition of October 2004 rainfall (around -5.5 per mil) the drips would have been influenced by between 2 and 25% of such water mixed with the storage component (which justified our comment that the dripwater is dominated by the latter). However, this calculation is spuriously precise, because we do not know the composition of the specific rainfall event or events that led to the input of the fracture-fed component since it was only feasible to sample rainfall monthly rather than daily.

p. 559. The error on the chronology is no more than the mean sampling interval of 2.5 years. By 'Cross-correlation', we simply mean 'comparison'

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