

Interactive comment on “Millennial-length forward models and pseudoproxies of stalagmite $\delta^{18}\text{O}$: an example from NW Scotland” by A. Baker et al.

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We thank the reviewer two for their thoughtful comments, and we agree that our aim in this manuscript was to make the first ever attempts at a millennial-length forward modelling and pseudoproxy investigation for speleothems. There is much more still to be done!

The main concern of reviewer two is the differences between the stalagmite series and pseudoproxy series in the spectral (time) domain. We would like to clarify that it is the input series, which does not contain a low frequency oxygen isotope signal, that means that the pseudoproxies also do not contain a low frequency signal. During our research, we did consider introducing a low-frequency component into the RANDOM input series, but given our poor understanding of the oxygen isotope – climate relationship over

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decadal timescales, we felt that this was not justifiable at this stage. This would be an avenue for future research, when the appropriate oxygen isotope rainfall input series are available.

With respect to other areas of clarification: the reviewer asks about split-half analysis against reanalysis data, but actually we performed a similar analysis already, in that we investigate both 20th century and post-1948 (NCAR) reanalysis products). the reviewer also asked for further examples of pseudoproxy – stalagmite analyses where agreement is demonstrated. However, this is provided in this paper for the instrumental period (Figure 6) and we have previously demonstrated this point in previous publications (Bradley et al., 2010; Baker and Bradley, 2010). the reviewer comments on the ‘spin-up’ of the model, and whether to hide that data. We think there might be some confusion between the timestep of the model used (monthly) and the concern over the spin-up time (which is 400 months, not years), but we can clarify this in a revised manuscript.

Baker, A. and Bradley, C., 2010. Modern stalagmite $\delta^{18}\text{O}$: Instrumental calibration and forward modelling. *Global and Planetary Change*, 71, 201-206
Bradley, C., Baker, A., Jex, C. and Leng, M.J., 2010. Hydrological uncertainties in the modelling of cave drip-water $\delta^{18}\text{O}$ and the implications for stalagmite palaeoclimate reconstructions. *Quaternary Science Reviews*, 29, 2201-2214.

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