



ACADEMIC  
PRESS

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

SCIENCE @ DIRECT®

Quaternary Research 59 (2003) 479

QUATERNARY  
RESEARCH

[www.elsevier.com/locate/yqres](http://www.elsevier.com/locate/yqres)

### Reply to Baker and Genty's comments on "A test of annual resolution in stalagmite using tree rings"

In Betancourt et al. (2002), we used regional tree-ring chronologies to test the purported annual resolution of a single, banded stalagmite from Carlsbad Cavern, New Mexico, USA, reported by Polyak and Asmerom (2001). We found no concordance between the noncalibrated stalagmite record and the well-calibrated tree ring reconstruction of regional precipitation. We remain skeptical that the Carlsbad stalagmite can be annually resolved, or even that periods of wide (narrow) bands necessarily imply sequences of wet (dry) years, as indicated by Polyak and Asmerom (2001).

Although Baker and Genty (2003) agree with practically all of our conclusions, they nevertheless feel that our "empirical" test paints too bleak a picture for banded stalagmites. They take this opportunity to summarize how individual laminae (bands) can form and review the growing list of correlational and monitoring efforts to calibrate climatic signals in banded stalagmites. In other words, there are several instances where annual resolution and climatic calibration of banded stalagmites are being hard won. We applaud these efforts and progress.

As outsiders to the field of speleothems, however, we are still concerned about the general lack of replication between individual, banded speleothems from the same cave or from different caves in the same region. The reason we are so confident about tree rings stems from consistent, empirical cross-dating of ring-width series across individual trees (and different species) in the same population and across populations in the same hydroclimatic region. The gist of our paper was that tree-ring chronologies can provide a routine means to test for annual resolution and climatic signals in contemporaneous speleothem records, particularly at places like Carlsbad Cavern, where there was no overlap with the instrumental record. These potential tests are not restricted to just cool-season precipitation proxies because tree-ring

chronologies are often well-calibrated with total annual precipitation and/or summer moisture indices that integrate temperature effects (e.g., Palmer Drought Severity Index).

Finally, we recall being at a similar juncture in the early 1990s, when scientists working on reconstructions from corals and tree rings routinely rubbed elbows at the annual Pacific Climate (PACLIM) Workshops (<http://meteora.ucsd.edu/paclim/>). Similar questions were raised then about sample replication and independent verification in banded corals, which we are happy to report survived the test of time.

### References

- Baker, A., Genty, D., 2003. Comment on "A test of annual resolution in stalagmites using tree rings." *Quaternary Research* 59, 476–478.
- Betancourt, J.L., Grissino-Mayer, H.D., Saltzer, M.W., Swetnam, T.W., 2002. A test of 'annual resolution' in stalagmites using tree rings. *Quaternary Research* 58, 197–199.
- Polyak, V.J., Asmerom, Y., 2001. Late Holocene climate and cultural changes in the southwestern United States. *Science* 294, 148–151.

Julio L. Betancourt<sup>a</sup>  
Henri D. Grissino-Mayer<sup>b</sup>  
Matt W. Saltzer<sup>c</sup>

Thomas W. Swetnam<sup>c</sup>  
<sup>a</sup> *USGS-Desert Laboratory*  
1675 West Anklam Road  
Tucson, AZ 85718, USA

<sup>b</sup> *Department of Geography*  
The University of Tennessee  
Knoxville, TN 37996, USA

<sup>c</sup> *Laboratory of Tree-Ring Research*  
The University of Arizona  
Tucson, AZ 85721, USA

*E-mail addresses:* [jlbetanc@usgs.gov](mailto:jlbetanc@usgs.gov), [grissino@utk.edu](mailto:grissino@utk.edu),  
[msalzer@ltrr.arizona.edu](mailto:msalzer@ltrr.arizona.edu) (J.L. Betancourt,  
H.D. Grissino-Mayer, M.W. Saltzer)

doi:10.1016/S0033-5894(03)00039-5