



Detection and origin of different types of annual laminae in recent stalagmites from Zoolithencave, southern Germany: Evaluation of the potential for quantitative reconstruction of past precipitation variability

Dana F.C. Riechelmann (1), Jens Fohlmeister (2), Rik Tjallingii (3,4), Klaus Peter Jochum (5), Detlev K. Richter (6), Geert-Jan A. Brummer (4), and Denis Scholz (1)

(1) Johannes Gutenberg-Universität Mainz, Institute for Geosciences, Mainz, Germany (d.riechelmann@geo.uni-mainz.de, scholzd@uni-mainz.de), (2) Ruprecht-Karls University Heidelberg, Institute for Environmental Physics, Heidelberg, Germany (jens.fohlmeister@iup.uni-heidelberg.de), (3) GFZ German Research Centre for Geosciences, Section Climate Dynamics and Landscape Evolution, Potsdam, Germany (tjalling@gfz-potsdam.de), (4) NIOZ-Royal Netherlands Institute for Sea Research, Department of Marine Geology and Chemical Oceanography, Texel, The Netherlands (Geert-Jan.Brummer@nioz.nl), (5) Max Planck Institute for Chemistry, Climate Geochemistry Department, Mainz, Germany (k.jochum@mpic.de), (6) Ruhr-University Bochum, Institute for Geology, Mineralogy and Geophysics, Bochum, Germany (Detlev.Richter@ruhr-uni-bochum.de)

An arrangement of three stalagmites from Zoolithencave (southern Germany) was analysed for different types of annual laminae using microscopic and geochemical methods. The speleothems show visible laminae (consisting of a pair of a clear and a brownish, pigmented layer) as well as fluorescent and elemental laminae. The growth periods of the speleothems were dated to AD 1800 to 1970 by detection of the 14C bomb peak, 14C-dating of a charcoal piece located below the speleothems, as well as counting of annual laminae.

On the annual time-scale, the variability of Mg, Ba, and Sr is controlled by Prior Calcite Precipitation (PCP) resulting in lower values during the wet season (autumn/winter) and vice versa. Both, Y and P are enriched in the brownish, pigmented layers and are proxies for soil activity. However, both elemental concentrations are also influenced by detrital content superimposed on the signal resulting from soil activity. Proxies for detrital content are Al and Mn.

Lamina thickness shows a significant correlation with the amount of precipitation of December of the previous year and January, February, March, April, May, and December of the current year (DJFMAMD) recorded at the nearby meteorological station Bamberg. Thus, lamina thickness is a proxy for past precipitation variability. This is confirmed by the good agreement with a precipitation reconstruction based on tree-ring width from the Bavarian forest. This highlights the potential of these speleothems for climate reconstruction at annual resolution (Riechelmann et al., submitted).

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