



Climate variability during MIS 11 – preliminary observations from an annually laminated flowstone from Central Europe

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The knowledge of past changes in climatic extremes and their recurrence interval is highly important for current and future societies. High-resolution studies of past interglacials provide insights in natural variability, recurrence intervals and the range of extremes during warm climate states. MIS 11 is a particularly interesting warm climate phase in the Quaternary as its orbital parameters closely resemble Holocene and modern-day conditions. Here we present an annually resolved MIS 11 speleothem record from Southern Germany. Long-term (centennial) climatic variations are quantitatively reconstructed from carbonate clumped isotopes and $\delta^{18}\text{O}$ values. Calculated drip water $\delta^{18}\text{O}$ values, corrected for the kinetic influence on the carbonate $\delta^{18}\text{O}$ (using clumped isotopes) and an independent temperature estimate for the fractionation factor, show variations of up to 3 ‰ whereas the carbonate $\delta^{18}\text{O}$ values are more constant (<1 ‰ variation). At annual resolution several elemental ratios (Mg/Ca, Ba/Ca, Sr/Ca and P/Ca) show periodic variability that corresponds in their frequency with that of visible layers, suggesting annual lamination. The cyclicity of the elemental ratios may provide an opportunity for the assessment of the influence of the past NAO/ENSO on central European climate during a slightly warmer time period.