

Study of calcite-water oxygen isotope fractionation at the recently depositing Szalajka tufa (Bükk Mts, Hungary): issues regarding paleotemperature calculations

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The stable carbon and oxygen isotope composition of freshwater carbonates can be used to study past climate changes. This study aims to test the usefulness of different equations, which are widely used to calculate the temperature of precipitation of different carbonates and are based on the temperature dependence of calcite-water oxygen isotope fractionation.

In the Bükk Mts. (NE-Hungary) several recent freshwater tufa deposit can be found and their precipitation is still in progress. One of the most spectacular tufa site is located within the Szalajka-Valley (Bükk, Mts., Hungary), where physicochemical parameters were measured in situ and water and calcareous tufa samples were collected along a downstream section for stable isotope analysis.

Based on our results we conclude that due to the relatively stable water temperature along the Szalajka-creek and the observed disequilibrium $1000\ln\alpha$ values, the Szalajka tufa samples are not useful to establish a paleothermometer equation for tufa deposits. Our results show that the tufa deposited at cascades are affected more by kinetic fractionation due to the elevated CO₂ degassing from water, thus, we suggest to avoid samples from cascades during paleotemperature calculations.

The stable isotope values of the Szalajka tufa samples fit to the data of tufas from other Hungarian mountains (e.g. Bakony Mts., Mecsek Mts.) and to the values from the neighbouring countries (Andrews, 2006) confirming that the oxygen isotopic composition of the meteoric water is the main driver for the $\delta^{18}\text{O}$ values in tufa samples.

Keywords: freshwater tufa, carbonate, stable oxygen isotope, paleotemperature