



Subaqueous carbonate speleothems as paleotemperature archives –clumped isotope thermometry and stable isotope compositions of inclusion-hosted water

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Clumped isotope measurements of carbonates and stable isotope analyses of water trapped in fluid inclusions are both promising techniques to determine carbonate formation temperatures. Cave-hosted carbonate deposits (speleothems) would be excellent targets for such studies, but kinetic fractionations and diagenetic influences frequently deteriorate the temperature data obtained with these methods. However, subaqueous carbonate deposits may provide reliable data as kinetic fractionations are less significant in underwater environment. In the present study subaqueous carbonate formations were investigated, whose formation temperatures were directly measured in the water. Additionally, temperatures calculated from oxygen isotope fractionations between calcite and fluid inclusion hosted water were compared with clumped isotope temperatures obtained for subaqueous carbonate formations in cave-hosted lakes. The clumped isotope temperatures fit the measured and calculated temperatures within the analytical precisions. Our study shows that subaqueous carbonate speleothems are useful targets for clumped isotope and inclusion water analyses, and therefore they are valuable paleotemperature archives.