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Stable isotope data and trace element variation from Holocene speleothems in Hungary

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Until now no long-term high-resolution terrestrial samples, like stalagmites were studied in Hungary for stable isotope geochemical studies and for paleoenvironmental and paleoclimatological examination.

During the past four decades, the majority of the paleoclimatological studies was concerned either of with investigating loess-paleosoil formations, pollens and lacustrine sediments. Our preliminary results suggest the importance of the better knowledge of the Holocene climate variability to reconstruct past changes in climate in the Carpathian Basin that has a unique geographic position between the Mediterranean, the Atlantic and the Polar climate influences in Europe.

We obtained 20 U-Th analyses for four stalagmites, using multicollector ICP mass spectrometer. The high precision of the speleothem MC-ICP-MS ages permits us to determine the timing of regional climatic events in the Pannon-Carpathian region and to see if they correlate with the global events. The U-Th analysis revealed that the samples were deposited mostly during the *pre- and early Holocene:* approx. from 13 to 9, 11 to 9, 11 to 6 thousand years ago (ka). One sample provide a continuous record for the last 6 ka.

High-resolution stable isotope profiles (number of 800 measurement pairs) of three partly contemporaneously deposited and one younger stalagmites from the Hungarian caves provide decadal scale δ^{18}O and δ^{13}C values. Our first results (e.g. investigation of a stalagmite core with a continuous 6000-years-old record) suggest that not only the global changes but several, short period cycles can be recognised on stalagmites deposited in isotopic equilibrium (so-called 'Hendy criteria').

Furthermore high-resolution profile measurements of the trace element analyses were carried out on the same samples using LA-ICP-MS measurements. Oscillations in e.g. phosphorus, strontium, barium concentrations revealed systematic variations with oxygen isotope values. Moreover the investigation of the U concentration in the youngest stalagmite revealed anthropogene effect on the sub-recent part as the 0,2-0,3 ppm abruptly increase and reach 2 ppm during the last decades.