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Lateglacial – Middle Holocene stable isotope records in two coeval stalagmites from Bihor Mountains, NW Romania

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Two stalagmites (S22 and S117) from V11 cave (Bihor Mountains, NW Romania) have been sampled for stable isotopes for the interval Late-glacial to Middle Holocene. V11 Cave is located in the Bihor Mountains at an elevation of 1254 m. It is situated in an area with alpine climate, mean annual temperature of around 4°C, 1400 mm/year precipitation and an average of 6 months of snow. The two stalagmites were collected from a passage, 200 m away from the cave entrance and some 60 m below the surface. The passage has no noticeable airflow and humidity is close to 100%.

Both stalagmites consist of yellow-brown low-Mg calcite, generally with columnar fabric. TIMS dating of the two stalagmites shows six growth periods occurring between 136 and 5.6 ka, separated by hiatuses. The last depositional interval occurred between 14.5 - 5.6 ka for S22 and 16 - 6.1 ka for S117 (Tămaş & Causse 2001). Based on high resolution TIMS dating and on morphological evidence, we assumed that S22 stalagmite growth was not interrupted during the interval sampled for stable isotope studies. S117 has a small growth hiatus between 10.9 and 10.3 ka, probably due to a slight changing of the feeding point.

Stable isotope analyses were performed at intervals of 2 mm for S22 and 1 mm for S117. The age model presented is based on 12 ages for S22 and 10 ages for S117, leading to calculated growth rates of 11.2 - 91.6 mm/ka for S22 and 2.8 - 82.8 mm/ka for S117. Two tests for kinetic isotopic fractionation were performed on each stalagmite. The maximum $\delta^{18}O$ variations within the growth layers were 0.49‰ and 0.53‰ (S22), and respectively 0.18‰ and 0,26‰ (S117).

The $\delta^{18}O$ and $\delta^{13}C$ profiles consist of 306 samples. For S22, $\delta^{18}O$ values range between -9,25‰ and -7,23‰ (VDPB) and $\delta^{13}C$ between -4.15‰ and –8.83‰. Isotope variations recorded in S117 are –9.3‰ - –6.69‰ for $\delta^{18}O$ and -9.1‰ - -5‰ for $\delta^{13}C$. The $\delta^{13}C$ and $\delta^{18}O$ isotopic profiles show no correlation during the Late-glacial, but they slightly correlated during the Holocene.

Carbon isotopes show an increasing trend from termination I, with high values (-4.15‰ -5‰) during the Younger Dryas, and then decrease by almost -3‰ at the Younger Dryas/Preboreal transition. The oxygen records drops with 0.6‰ to –1‰ at the Allerod/YD transition, but they remain low during the whole Preboreal. A corresponding increase is recorded at around 10.2 - 10 ka BP. From 10.3 ka onwards, both the $\delta^{18}O$ and $\delta^{13}C$ profiles have a slightly increasing trend, but less oscillations.

The stable isotope analysis of the two stalagmites from NW Romania provide a terrestrial record which reflect Late-glacial and Holocene environmental changes. The profiles can be correlated with other terrestrial records, such as stalagmites and lacustrine sediments.

References

Tămaş, T., Causse, C., 2001. U–Th TIMS chronology of two stalagmites from V11 Cave (Bihor Mountains, Romania). Theoretical and Applied Karstology, 13-14, 25-32.