Goldschmidt2007

Siklósy Z, Demény A, Vennemann T.W, Hegner E, Kramers J, Lauritzen S.E., Leél-Őssy Sz_Climate changes and volcanic signals during the Bronze Age: a stalagmite record. Geochimica et Cosmochimica Acta, Vol. 71, Issue 15, Supp. 1, p. A936

Climate changes and volcanic signals during the Bronze Age: a stalagmite record

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In this study we present high-resolution and multi-proxy records of a Holocene stalagmite showing ***volcanic signals detected the first time in a stalagmite by REE analyses***. Stable oxygen and carbon isotope data profile along the speleothem deposited during the last 5000 years in the Mecsek Mts. (S-Hungary) suggest relatively stable conditions in most of the studied period. However, a significant d18O decrease (>2 %o) between approx. 3800 and 3500 years BP occurs in the record. Fluid inclusion water shows also significant D-depletion, supporting cooling. Combined isotope and trace element measurements indicated coupled temperature and precipitation quantity changes occuring in the above period. Rare earth elements (REEs) were also measured by LA-ICP-MS technique, and unlike the longer trends shown by C and O isotopes, the REE and Y distributions indicate sudden changes at the beginning of the cooling period. The La/Y ratio of this segment shows similarities with the volcanic rocks of of the Thera (Santorini) eruption that occurred at about 3650 years BP. As an independent indicator, 87Sr/86Sr ratios show slight decrease at the REE peak, supporting the inferred volcanic signal.

The climatic conditions ameliorated rapidly (within ~100 years) to close to present day conditions as reflected by the C, O and H isotope compositions. However, some of the trace elements show marked changes following the recovery. Elements indicating detrital material within the carbonate matrix (e.g. Si, Al, Th) show marked elevations, along with 87Sr/86Sr increase, suggesting increased amount of silicious material transported by dripwaters. However, the Mg content is also higher at this section part, thus, the increase of detrital material amount may be related to lower carbonate precipitation rate, rather than to stronger weathering of silicate rocks.

This study was financially supported by the Hungarian Scientific Research Fund (OTKA T 049713) and the Hungarian Scholarship Board (travel grants to Z.S.).