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# Middle bronze age climate change recorded in a Hungarian stalagmite: triggering by volcanic activity?

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Geochemical records of speleothems are extensively applied in paleoclimate studies as they provide valuable proxies of continental changes. Well studied speleothems from the Carpathian region are scarce, thus, multiproxy analyses have been started at the GEOCHEMISTRY and PALEOCLIMATE RESEARCH GROUP (Hungarian Academy of Sciences, www.geochem.hu/gp). In this study we present high-resolution and multi-proxy records of a Holocene stalagmite. Initial oxygen and carbon isotope analyses and age dating revealed strong changes within the section (Siklosy et al, 2006), whose origin was the focus of this study. An off-line preparation method for D/H analyses of inclusion water for continous flow mass spectrometry (Demeny and Siklosy 2006) was developed to achieve decadal (1-2 mm) resolution.

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, MC-ICP-MS dating showed that a significant 18-O decrease ($>$2 permil) centered between approx. 3800 and 3500 years BP. Beside the O-isotope change H-isotope values show also significant D-depletion, proving strong cooling at about 3800 yr BP. Combined isotope and trace element measurements indicated coupled temperature and precipitation quantity changes occuring within the above period. Beside these conventionally studied trace element contents, rare earth elements (REEs) were also measured by LA-ICP-MS technique at 50 micron resolution. The REE composition of the section studied revealed volcanic de-

rived impurities built into the stalagmite at the onset of the cooling event. The La/Pr vs. La/Nd ratios of the laminae with elevated REE contents formed at the beginning of the cooling period are analogous those of the tephra layers from the GRIP ice core record (Pearce et al., 2004, cca. 3650 years) and the volcanic rocks of Santorin (Vespa et al., 2006), Greece (commonly known as Thera) and Aniakchak (Alaska, USA) of the same age, but can be clearly distinguished from other eruptions. The Santorini (Thera) eruption occurred at the late 17th century BC, 40 miles north of Crete (Manning et al., 2006), inducing tephra deposition at least in the Nothern Hemisphere. The timing of Middle bronze age climatic event shown by the speleothem studied is in accordance with the timing of the decline of some Cretan cities (e.g. Knossos). Finally, climatic conditions has ameliorated rapidly (within cca. 100 years) to close to present day conditions in the studied region of Southern Hungary.

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