



Introduction of magnetic methods in environmental research in Croatian karst and its implications for paleoenvironmental reconstructions

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Cave sediments and speleothems are valuable archives of past environmental conditions due to their large geographic extent and extensive time scales. They contain geochemical and paleoenvironmental data and therefore represent one of the front lines in research of paleo processes in paleo environments.

The Dinaric karst of Croatia, characterized by complex and deep caves, is a promising location for this kind of research. The complexity and large dimensions open the need for the introduction of fast and inexpensive methods that can detect locations and patterns for further detailed research. We aim to introduce the relatively new method of magnetic susceptibility (MS) in environmental research in Croatian karst, in addition to usually used geochemical and mineralogical methods. First such measurements in Croatia were performed by Frančišković-Bilinski (2008) on the samples from Kupa River watershed. Preliminary measurements showed the highest values of magnetic susceptibility in the lower flow of Mrežnica river and increased values of magnetic susceptibility in the upper flow of the Dobra River.

Elevated values of MS, thus elevated concentrations of heavy metals, could be of natural or anthropogenic causes, or sometimes combination of them. In deep pits of Croatian karst most of elevated values are results of natural processes, e.g. in Lukina jama pit, where largest number of element anomalies are present. In Lukina jama a whole series of elements, including many heavy metals, show extreme values (Pb, Cu, Zn, Mn, Ni, Cr, Co, Ba, K, Mg, Li, Be, Al, U, Si, Ti, W, Fe, As). We aim to determine those processes, which caused such elevated concentrations of particular elements and in such way to reconstruct paleoenvironmental conditions. Our current investigations aim to investigate changes of MS and elemental concentrations with depth, which we are studying on examples of two deep pits – Slovačka jama pit and Cave system Velebita.

The most recent study was performed by Kamenski (2018) in three profiles in Slovačka jama pit and in two profiles in Kita Gaćešina-Dražanova puhaljka pit, where magnetic susceptibility was measured. Obtained MS results were compared with mineral composition, obtained by X-ray powder diffraction (XRD). It was concluded that samples with values higher than 50×10^{-5} SI contain minerals which contain metals, e.g. iron, aluminum, etc. Samples with higher metal content have proportionally higher MS values. Sediments with prevailing carbonate minerals and quartz are diamagnetic and have lower MS values, lower than 40×10^{-5} SI. For full understanding of precipitation processes of cave sediments, a series of additional MS measurements are necessary along the whole cave/pit length/depth. Then, on locations with large MS variation sampling should be performed and later elemental and mineralogical content analyzed.

Rererences:

Frančišković-Bilinski, S. (2008). *Mineralogical Magazine* 72, 1, 43-48.

Kamenski, A. (2018). Diploma thesis, Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb.