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Late Quaternary climatic history of NW Romania: results from Th/U dating of speleothems

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Speleothems are secondary minerals that precipitate in caves, most commonly as stalagmites, stalactites and flowstones. They are primarily composed of calcium carbonate, precipitated by slow degassing of carbon dioxide from supersaturated waters entering the cave gallery. Trace elements may be transported in solution and co-precipitated in calcite. One of these, uranium, when in concentration that exceeds 0.01 ppm allows precise age determination by U-series dating methods. Speleothem growth is a sensitive indicator of both temperature and humidity, and changes in either one or both of these can cause periods of enhanced or reduced growth. Furthermore, the worldwide karst landscape distribution and the study of speleothems growth interval enable regional chronologies to be drawn up. Uranium concentration in speleothems depends on several factors: uranium content of the host rock, residence time in the underground water, HCO_3^- availability etc., and thus is highly variable from one speleothem to another or even in the same speleothem. The dating technique is based on the precipitation of small quantities of uranium in speleothems, in the desirable absence of thorium. After the deposition, a gradual increase in ^{230}Th occurs in the speleothem, resulted from the disintegration of ^{234}U. The age of the speleothem depends on the $^{230}Th/^{234}U$ ratio measured. In this presentation we discuss ages obtained through alpha, mass spectrometry, and MC-ICP MS on speleothems from caves in the Bihor and Padurea Craiului Mountains, covering the whole dating interval for the $^{230}Th/^{234}U$ method. Growth intervals may be assimilated with climate periods favorable for speleothem deposition (existence of diffuse groundwater recharge and biogenic production of CO_2 in soil). The speleothem growth frequency record provides a well-dated terrestrial chronology for the past 350,000 yr B.P., which directly reflects regional paleoclimatic conditions in NW Romania. Our study should prove very useful in understanding the regional nature of climate variability in a geographic area that is under-represented by current Upper Pleistocene high-resolution data, providing at the same time the means for comparing our regional data with data from Western Europe and its possible linkage to NAO and other large-scale atmospheric circulation systems.