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Climate control of rock magnetic properties of cave sediments

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Rock magnetic parameters of sediments reflect palaeoenvironmental and paleoclimatic conditions during deposition in the marine and in the continental realm. Cyclical changes in the magnetic mineral assemblages occurring at the orbital periodicities involved in the standard Milankovitch theory have been observed in numerous sedimentary records confirming the relationship between rock magnetism and past global change. In this respect cave sediments were longtime neglected, but in the last decade several studies about magnetic properties of cave sediments have been published. These studies have shown that the magnetic susceptibility data of cave sediments reflect both long- and short-term climatic oscillations. Magnetic susceptibility variations are attributed to changes in climate-controlled pedogenesis and the production of low coercivity magnetic mineral phases, magnetite and maghemite, outside the cave. The soils are then washed, blown or tracked into the cave where they accumulate, creating the changes observed in rock magnetic data. We present several studies of rockmagnetism in cave sediments from the Apuseni and South Carpathians Mountains (Romania). In each cave we used various rockmagnetic methods (variation of magnetic susceptibility with fields, frequency and temperature, anisotropy of magnetic susceptibility, hysteresis properties) and sedimentologic (granulometry, calcimetry, LOI, geochemistry) methods to characterized the studied deposits. In general the sections are relative short both in length (2 to 9 m) and time and the source area of sediments is highly variable, which make difficult the interpretation of magnetic signal in terms of climate. The best results can be obtained from fine sediments. When several magnetic parameters from several caves are plotted together a clear trend can be observed, which can be interpreted in terms of paleoclimate. Low magnetic susceptibility and low frequency dependence magnitudes indicate times of cooler/drier climate resulting from reduced pedogenesis, while warmer/wetter times yield higher pedogenetic rates and thus higher values for the magnetic susceptibility and frequency dependence.