Hydrogeochemical process and its environmental indication of drip water: Study on four caves of Guizhou, China

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In rainy season, NaCl was used to trace sources of cave drip, time scales of drip water responding to precipitation, and processes of water dynamics in four cave systems of Pearl watershed in Guizhou, China (Liangfeng cave in Libo, Qixing cave in Duyun, Jiangjun cave in Anshun and Xiniu cave in Zhenning). Because of the diverse karst cave surroundings, interconnection of water transporting ways, water dynamics processes etc, the time scale of drip water in four caves responding to rainfall is 0~40 days. According to the characteristics of water transporting in cave roof, pathways of water movement, types of water head etc, the drip water of four caves can be divided into five hydrodynamics types. Simultaneously, according to the research of element geochemistry, water transporting in the cave roof influences the sources of the substances, and the substances in drip water mainly come from the soil in the roof caves except that the fewer content of elements originates from the rainfall, but the longer drip water responds to rainfall the less substances come from soil. With the temperature rising, soil water is characterized by higher CO_2 partial pressure. Water penetrates rock fissures and dissolves rock till quickly saturated, and then the calcite precipitates on the route of water transport. The change of element contents of cave drip composition is controlled by all of the processes. Dilution does not happen in the roof of caves, but different sources of water coming from and (or) piston flow have some effects on the drip water composition, however, the effect is much fewer. The result implies that the speleothems of 4 caves probably had preserved the information of environmental change. It implied that the index of past environmental change recorded in karst speleothem is influenced by hydrogeochemical process of water transport in the roof of cave (rock dissolved and calcite precipitation), time scale of drip water responding to rainfall, hydrodynamic process and ways of water transport in the cave roof etc. From this point of view, accurate interpretation of the index of past karst environmental change must be supported by clearly understanding hydrogeochemical dynamic process of drip water. The clarification of the process of drip water will contribute to the further studying karst environmental change of high resolution and short time scale of speleothem record.

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