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Hydrogeochemical characteristics and environmental implications in water from Loufang cave, NE Sichuan

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Cave Monitoring is important for understanding cave system processes based on speleothem paleoclimate reconstruction. In this study, monitoring of Loufang Cave in NE Sichuan, Central China, is reported. Monthly measurements of micro-environmental parameters in Loufang Cave, including cave air temperature, relative humidity (RH), CO_2 concentration, electrical conductivity (EC) and pH value of waters were conducted, and water samples were collected for trace element analysis between August 2011 to June 2012. The micro-environment of Loufang Cave displays notable seasonal variations. Cave air temperature is 3$\sim$5 $^\circ$ higher in summer than in winter. Relative humidity inside the cave is usually inversely related to cave air temperature, suggesting a dominant regulation by air temperature. The CO_2 concentrations of cave air increased significantly during the rainy season. They may be strongly influenced by the "pump" effect, biological respiration, and ventilation. The pH values of cave water are higher in summer and autumn than in winter and spring, similar to the seasonal variations of EC. Both pH and EC values may be mainly influenced by Ca^{2+} concentrations of cave waters.

Contents of trace elements Ca, Mg Sr and Ba in river and cave waters also display significant seasonal variations. Both Sr and Ca content are higher in cave waters than in river water. Ba content is significantly higher in river water than in cave water, whereas no obvious difference for Mg content in river and cave waters is observed. The difference in the variation of trace elements may be related to the sources. Usually, Sr content and Sr/Ca ratio at all sites were relatively high in winter and spring and low in summer and autumn, implying that the two proxies are mainly affected by water-rock interaction and atmospheric dust deposition. This observation supports previous arguments that speleothem Sr (or Sr/Ca) and $^{87}Sr/^{86}Sr$ at the study site could be used as potential indicators of atmospheric dust activity and winter monsoon variations.