



Relationship between speleothem d13C and karst-desertification in western Guizhou

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Based on ASTER images, ARCGIS data analyses, GPS maps and field investigations, we have established the map of distribution and degree of the karst-desertification in western Guizhou, China. Three cave areas with different degrees of the desertification were selected for comparison study: Jiangjun Cave of Qingzhen County with no desertification, Houzi Cave of Shuicheng County with moderate desertification and Shijiangjun Cave of Anshun County with strong desertification. Newly deposited speleothems in the caves, soils, bedrocks, vegetation plants around the caves were collected, and analyzed for d13C.

In the Houzi Cave area, C3 type plants are abundant with d13C value as light as -47.40 (permil, PDB). The d13C value of vegetation and soil around the cave ranges -27.78- -47.40 permil, averaging -32.75 permil. In contrast, vegetation coverage is extremely low in the Shijiangjun Cave area, and the d13C value of the vegetation and soil ranges from -19.07permil to -26.92permil with an average of -24.33permil. The lighter d13C value in the Houzi Cave area is resulted from more intensive vegetation coverage and higher C3/C4 plant ratio. Corresponding to the surface vegetation conditions, the new deposited speleothems in Houzi Cave have d13C values of -3.91permil to -6.30permil with an average of -5.21permil. The d13C values of modern speleothem from Shijiangjun Cave are 0.38 to -1.95permil, averaging -0.87permil. The heavier d13C of speleothem from Shijiangjun Cave cannot be caused by the surrounding bedrock because the bedrock's d13C is 1.21permil which is lighter than that of Houzi Cave bedrock, being 3.80‰. On the same token, the modern speleothem in Jiangjun Cave has the lightest 13C values, ranging -6.80 - -9.18permil and averaging -8.30permil due to abundant vegetation coverage and non-desertification shown by the map of distribution and degree of desertification.

Our result shows that speleothem 13C can reflect mainly changes in vegetation and soil though other factors may play a role. This phenomenon provides us the foundation to use speleothem 13C records for studying evolution of karst-desertification. Since the three caves are located in a similarly climatic setting, the modern karst-desertification is mainly attributed to human activity.