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Implications of stable isotopes and elemental ratios in modern soda-straws from Zhijin Cave, Guizhou, China

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Two 8-cm long soda-straws, ZJD-9C and ZJD-11A, were collected from Zhijin Cave, central western Guizhou when they actively grew in January 2006. ^{210}Pb dating indicates that they are less than 100 years. We have analyzed δ^{18}O, δ^{13}C, and concentrations of Ca, Mg, Sr, Ba, Fe, Mn on 16 samples of each soda-straw with a sampling interval of 0.5cm. The δ^{18}O values of two soda-straws resemble strong similarities, which increased from about -8.3‰ (PDB) around 1920-40 to about -6‰ at the present. The δ^{18}O increasing trend is strongly influenced by the decreasing trend of local precipitation during the past 80 years. ZJD-9C and ZJD-11A show different δ^{13}C variations, with δ^{13}C values ranging -8.63‰ to -9.55‰ and -8.70‰ to -7.23‰ (PDB), respectively. The heavier δ^{13}C values of ZJD-11A reflect less vegetation coverage in the surface above the sample site. In this soda-straw, Mg/Ca and Sr/Ca have strongly similar trends to that of the δ^{18}O, which may represent prior precipitation of calcite from seepage water in the epikarst. As rainfall decreases, the residence time and/or degassing of $CO_2$of seepage water increases, which leads to enhanced prior precipitation of calcite. In ZJD-9C, Mg/Ca and Sr/Ca are generally inversely correlated, and no correlated with the δ^{18}O trend. The Mg/Sr variations of ZJD-9C which are controlled by its Mg/Ca variations show strongly correlation with changes in the annual air temperature. This may be because of more intensive vegetation coverage in the surface above the sample site, which buffers the moisture content in the epikarst and reduce prior precipitation of calcite. In this case, the co-precipitation of Mg with Ca in the soda-straw is mainly controlled by the temperature of calcite precipitation. Therefore, Mg/Sr (or Mg/Ca) ratio may be positively correlated with cave temper-

ature hence air temperature. Fe and Mn contents in both soda-straws co-vary each other, with much lower concentrations in ZJD-9C. Again, lower Fe and Mn contents in ZJD-9C may refer better vegetation coverage and lower oxidation condition in the surface above this site. Our results contribute to studies on the mechanisms of climatic and environmental proxies in speleothems.