Behaviour of stable carbon and sulfur isotopes in soils of a karst region

Y.-C. LANG*[1], L.-Y. TIAN[1], C.-Q. LIU[1], H. DING[1], Q. J. GUO[2], Z.-Q. ZHAO[1] AND T.-Z. LIU[1]

[1]State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, Chinese Academy of Sciences, Guiyang 550002, China (*langyunchao@vip.skleg.cn)

[2]Center for Environmental Remediation, Institute of Geographic Sciences and Natural Resources Research Chinese Academy of Sciences, Beijing 100101

The purpose of this study was to examine the characteristics of carbon and sulfur cycling in limestone and sandstone soils, and the processes affecting the cycling. Soil pH, C/N ratio, soil inorganic carbon (SIC) and soil organic carbon (SOC) contents, abundances of different facies of sulfur, and multiple isotopic compositions ($\delta^{13}C_{SOC}$, $\delta^{13}C_{SIC}$, $\delta^{34}S_{SO4}$, $\delta^{34}S_{OS}$) were measured in soil profile samples collected from karstic slopes. The sandstone and limestone soils have distinct pH values, but show similar SOC contents. The variation signatures of the $\delta^{13}C_{SOC}$ values along the soil profiles can be explained in terms of SOC decomposition, input of different plant types (C3 and C4 type plants), and soil erosion at upper and accumulation at the lower site. Organic sulfur (OS) was the dominant fraction of total S in all soil samples. The concentrations of OS in the limestone soils has relatively constant $\delta^{34}S$ values, but considerable variability in the sandstone soils. In general, the sulfate contents of the limestone soil samples shows higher $\delta^{34}S$ values than the sandstone soil samples. The results suggest that the sulfate in the top soils of the limestone soil profile has two origins, which were derived from atmospheric deposition and oxidation of organic sulfur. And the sulfate in the sandstone soils were derived from oxidation of sulfur-containing organic matter.

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