Spatial variation and isotopic behaviour of Zn in soil from a typical polluted farmland in karst area, South China

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Heavy metal pollution in farmland is more and more serious since recent years, which can endanger the health of humans and the ecology of local environments. The mobility of heavy metals is quite substantial in karst area due to the subtropical climate and the underlying karst lithology, increasing the difficulties of management.

The study focused on the typical farmland around the Pb-Zn mine in the karst area of Guilin, Guangxi Zhuang Autonomous Region, southern China. Surface and profile soil samples were analyzed and the results revealed the distribution and speciation of Zn. The maximum content of Zn in polluted soil profile was 4894mg·kg^{-1}. Zn was mainly existed in residue and organic fraction. Intense eluviation caused soil acidification, leading to lots of exchangeable Zn migrate down. Thus, the deep soil was heavily polluted.

The isotopic signature of Zn indicated that tailings was the main anthropogenic source, whereas contributions from rainwater, vehicle exhaust, coal and fertiliers were limited. Zn isotope in the soil was affected by eluviations, leadind to loss of heavy isotope while the absorption of plants, soil organic matter and Fe-Mn oxides had little effect. The accumulation of litterfall could be another reason for lower Zn isotopic composition in surface soil.

The elemental abundance, speciation and isotopic behaviour of Zn in lateral and vertical dimension provide a deeper insight into heavy metal pollution in farmland. Combined with the characteristic of karst geology and hydrology, this will serve as a guide for developing effective strategies of soil remediation.

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