Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

MIS21-P14 Room:Convention Hall Time:May 23 17:15-18:30

The distribution and circulation of Ca in ecosystem of the acidified drainage basin in Guangdong province, south China

YOKOO, Yoriko[1*], YOH, Muneoki[2], FANG, Yunting[2], MO, Jiang-Ming[3], NAKANO, Takanori[4]

[1]Doshisha University, [2]Tokyo Univ. of Agriculture and Technology, [3]South China Botanical Garden, [4]Research Institute for Humanity and Nanture

This study was undertaken to determine the elemental and strontium isotopic compositions ($^{87}Sr/^{86}Sr$) in rainwater, stream water, plant, soil, and bedrock of the acidified drainage basin (Dinghushan: DHS) and the slightly acidified drainage basins (Heishiding: HSH and Conghua: CH) in Guangdong province, south China and to clarify the contribution of atmospheric deposition to Ca and Sr circulation in the acidified ecosystem. In order to assess the distribution of the plant-available elements in soils, a sequential extraction procedure that extract the water-soluble, exchangeable, bound to carbonates, bound to Mn oxide, organic, bound to amorphous Fe oxide, bound to crystalline Fe oxide and residual silicates components from soil was performed.

Strontium and Ca in the plant-soil ecosystem are mostly derived from atmospheric deposition in DHS, HSD and CH basin. The $^{87}Sr/^{86}Sr$ ratios of dominant tree leaves were identical to those of the exchangeable fraction in soils. Their ratios were lower than those of bedrock and bulk soil and were close to those of rainwater. The contribution of the atmospheric deposition to plant and the exchangeable fraction of soil in DHS are up to 90%, because sandstone, shale and granite that have low Ca and Sr concentrations are composed of the bedrock in DHS, HDS and CH, respectively.

The lack of plant-available Ca, Mg, K, and P and the leaching of Cu, Al, Fe and Zn from Fe-oxide to mobile fraction occur in the DHS acidified soil. The pH values of soils showed that DHS soil is more acidified than HSD soil. In acidified soil from DHS, the percentages of the water-soluble and exchangeable Ca, Mg, and K decreased. The $^{87}Sr/^{86}Sr$ ratios of bulk soil were same to that of the weathered sandstone in DHS, indicating that almost of Sr and Ca in the DHS acidified soil were distributed into silicate. On the other hand, the percentages of Cu, Al, Fe, Zn and P bound to oxide decreased and those of the water-soluble and exchangeable Cu, Al, Fe and Zn and P bound to organic matter increased in DHS.

The chemical compositions of stream water in DHS and HSD are affected by bedrock such as sandstone, shale and granite involving low Ca contents. Especially, the acidified drainage basin has an influence on the chemical compositions of stream water in DHS. The pH values of steam water were 3.86-4.58 and 6.5 in DHS and HSD, respectively. Calcium concentrations of stream water were less than 3 ppm in both sites. The $^{87}Sr/^{86}Sr$ ratios of stream water were lower than those of exchangeable fraction in soils, and were close to those of rainwater. These results indicate that most Ca and Sr in steam water are originated from atmospheric depositions. In DHS, Al and Zn concentration were high in stream water. These elements are derived from high contents of exchangeable fractions in acidified soil.